THE IRON AGE — July 5, 1934

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Contents

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EIGHTIETH YEAR OF SERVICE TO THE METAL WORKING INDUSTRY

▲▲▲ THE IRON AGE ▲▲▲

JULY 5, 1934

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Chaos Misses Its Train

"The machine age has defeated us, the price system is doomed and we are faced with the threat of national bankruptcy and perhaps general chaos within 18 months."

From the article, "What Is Technocracy?" in the New Outlook, *November, 1932.*

THIS was the cheerful message delivered to America just 20 months ago.

Chaos is now two months overdue, according to this prophecy. And it does not appear that there is any likelihood of its arriving even by later train.

Instead of plunging headlong into the abyss, as predicted, manufacturing activity in the United States in April, 1934, the scheduled arrival date of chaos, was just 33 1/3 per cent greater than it was in November, 1932.

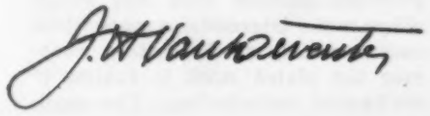
Other countries "suffering" from the "price system" have shown equally disappointing results in so far as the prophets of gloom are concerned. In the first quarter of 1934, industrial production in Great Britain averaged 13.3 per cent above its level of November, 1932; Canada, in March of this year, showed a 28 per cent increase; Sweden, in the current February, a 30 per cent gain, and France, 9 per cent, in this February, all compared with November, 1932. No country of any industrial importance failed to show a gain.

More recent gloomy predictions have shown an equal reluctance to make good for their sponsors. It was not so long ago that American business suffered from cold chills and cold feet through the threat of a general automobile strike. More recently the threatened business depressant was the non-materializing general steel strike. Most of the things that keep us awake nights worrying never happen.

There are many who will regard the current sudden drop in steel production as a signal for business caution. They will see it as an indicator of a recovery collapse, instead of encouraging proof that producers and consumers alike recognize the passing of the strike threat and the beginning of the end of the closed shop labor lobby.

Like the old ladies who go to see "horror" pictures so that they may have their blood curdled, many business men will pay good money for supposedly "confidential" services that profess to give them privileged peep holes to the veiled economic and political future in order that they may plan their business actions. Unfortunately, good news is not nearly as salable as is bad; hence the consistent but changing procession of terrifying and largely imaginary bogies which are paraded past these peep holes.

It is about time that American business men held an experience meeting and found out what it has cost them to act upon pessimistic forecasts. The inveterate optimist may not be a safe guide to follow, but his accuracy record for the next few years will be far ahead of that of the prophets of gloom.



Rapid Testing of the Characteristics

AN accurate determination of the ultimate thickness and the quality of metallic coatings is a most timely requirement of the entire plating industry. Therefore a careful scrutiny should be given this article by an internationally known authority on electro-metallurgy, which presents a unique method of easily finding the thickness of an outer pure metallic coating, and, in addition, shows how the thickness and quality of the intermediate layers of binary alloys can be estimated with precision. The case of zinc-coated iron wire is treated in detail and the same practices can be used for tin, cadmium, copper, nickel, and various other pure metal coatings. The author discusses only the case of coated wires, but a simple manipulation of the developed formula extends its usefulness to flat surfaces. Only 5 to 10 min. are required for each test, and the procedure is practically automatic, thereby making it useful as a routine laboratory test for product control.

THE accurate determination of the thickness and other characteristics of metallic coatings is in many ways a rather difficult technical problem. Thus, a chemical analysis of the amount of metal used as surface protection of various metallic products, is only indicative of the total percentage of the metal as a chemical element. Due to alloying effects of the coating upon the underlying metal, the actual thickness of the coating depends also upon various metallographic reactions between both phases which, in turn, are functions of the applied methods of plating.

In a majority of instances the thickness of intermediate zones of alloys increases with the temperatures utilized in plating. Accordingly, coatings produced by the immersion of various parts in molten metals are characterized by heavier layers of alloys (as gradation zones) in comparison with those of electro-plated surface layers. The existence of intermediate layers of mostly binary alloys, however, has a very marked influence upon the quality of the coating because of the well known different properties of alloys as compared with those of the respective components. Many metal plating processes produce hard and brittle alloys in the intermediate zones which cause cracking of the coating whenever the plated stock is subject to mechanical deformation. The spalling and "pealing" of surface layers is frequently observed and may be traced to the brittle alloys of such binary systems as Fe-Sn, Fe-Zn, Cu-Cd, etc.

As outlined before, even a reliable chemical analysis of a metallic coating fails to give the desired information. Perhaps the most generally used procedure in studying the properties of surface layers consists so far in a judiciously conducted microscopic examination of cross-sectional specimens of plated articles. Although it is possible to measure the thickness of various layers with considerable accuracy, this method requires expensive laboratory facilities, experienced personnel, and is quite time consuming. If specific care is not exercised in the preparation of the samples for microscopic investigation, the coating is easily "smeared" in polishng or the coating metal reacts with some ingredient of the low melting alloy used for mounting the specimen. Almost needless to state, these and similar factors may to a considerable extent affect the accuracy of any experimental deductions.

In addition to the methods described above probably the most common procedure of testing galvanized articles, especially galvanized wire, was that by Preece, wherby the thickness of the entire coating is estimated from the time required for complete solution of the coating in a neutral concentrated solution of copper sulphate. In laboratory routine the number of "dippings" of definite duration (ordinarily 1 min.), required to completely dissolve the coating up to a bare wire, serves as an index of the time factor in the Preece test. The simplicity of this method is perhaps the only explanation for its practical utilization up to the present time. Modifications of the Preece test consist in dissolving the zinc coating in acids and in calculating the volume or weight of the coating from the difference in weight or by measuring the volume of the liberated hydrogen.

Several of the above alternatives were advocated by Auperle[1], Bauer[2], and Bablik[3]. Other investigators, such as Burgess[4], Walker[5], and Hall[6] coordinated the thickness of metallic coatings with velocities of solution. R. Vondracek[7] and his collaborators at the Technical University of Brno, Czechoslovakia, have determined the thickness of zinc coatings more accurately by dissolving the surface metal in sulfuric acid and measuring the volume of hydrogen which results. The principle of this method bases on the fact that sulfuric acid readily dissolves zinc and zinc alloys whereas low carbon iron is practically not attacked. As the chemical equivalents of Zn and Fe are numerically very close, it is possible to calculate the thickness of a zinc coating if the length and original diameter of the tested wire are known. However, it is difficult, if not impossible, to correlate the qualitative characteristics of the pure surface layer of zinc and the underlying gradation or alloy zone. This latter relationship seems to be about the most important index of the quality of galvanized wire or galvanized products in general.

Bearing in mind the many shortcomings of the numerous contemporary methods, the development of a rapid, cheap, and reliable process for the determination of metallographic properties of all metallic coatings seemed to warrant an exhaustive search for such a more or less universal procedure. After considerable experimentation, the author has conceived an electrolytical method which

# of Metallic Coatings

By DR. ALEXANDER GLAZUNOV
Professor of Theoretical Metallurgy at Pribram, Czechoslovakia

appears to fulfill all the above requirements in a quite satisfactory manner.

Experimental Procedure

This determination of the characteristics of metallic coatings is based on electrolysis. Therefore the electrolyte must be a concentrated, slightly acidified solution of a simple salt (sulphate, chloride, etc.) of the metal which has been used in coating the wire. The specimen selected for the test is submerged vertically into the solution. In order to make the test as accurate as possible an exactly measured length of the sample is exposed by covering both ends of the wire with paraffin, wax or similar material. The length of the wire exposed to electrolytical action is thus accurately determined. The length of the exposed wire is not specified, but 3 to 4 cm (1.25 to 1.625 in.) are ample for a reliable determination.

The sample is connected to the positive end of a storage battery, electric cell, etc., which has a voltage of 4 to 8 volts. A cylindrical cathode surrounds the wire sample. The moment of closing the circuit is recorded by a stop watch and volt as well as ampere readings are taken at frequent intervals. During the original experiments both were read every 15 sec., but it was soon discovered that automatically registering voltmeters and amperemeters are satisfactory and far more convenient.

Inasmuch as the electrolyte is a concentrated solution of a salt of the respective metal, no changes in its concentration or composition will be noted during the anodic solution. Therefore the electric resistance remains practically constant during that part of the test. It is evident that during the anodic solution of the pure metallic coating both voltage and amperage also remain constant and their respective values will be shown as a horizontal straight line when diagramatically recorded. After the pure metal of the coating goes into solution the intermediate layer or gradation alloys of the coating are exposed for electrolytical action. The anodic potential will change (ordinarily increase), and the current intensity will decrease. The first deviation from a horizontal straight line in the time-voltage diagram therefore indicates that the surface layer of the pure metal has disappeared and the intermediate zone has been reached. During the anodic solution of the intermediate alloys of the coating metal the voltage will constantly deviate from its previous momentuous value (being ordinarily of an increasing magnitude). A curve is thus recorded for this part of the diagram. Upon disappearance of the gradation alloys by the dissolving action of the electrolyte, the original metal is exposed to the solution and a new direction of the curve, i.e., another horizontal line, marks the instant when the entire coating has been removed. This indication also marks the end of the necessary readings.

The exact thickness of the metallic coating may then be calculated from the electro-chemical equivalent, the specific gravity, and the diameter or thickness of the tested wire. The mathematical relationship for the measured values reads as follows:

$$d = \frac{e \times A \times t}{s \times 1 \times 2\pi.r}$$

where
d = Thickness of surface layer (in cm.).
e = Electrochemical equivalent.
A = Intensity in amperes.
t = Time in seconds.
s = Specific gravity in gm./cm³.
l = Length of the wire (in cm.).
r = Radius of the wire (in cm.).

It will be noted that $l \times 2\pi r$ represents the wire surface exposed. For a flat surface the area exposed could be substituted.

The gradation zone between the surface layer and the original metal is represented by a difference in amperage for both alloying elements. An accurate mean coefficient for the gradation alloys may be determined from the quantitative ratios of the

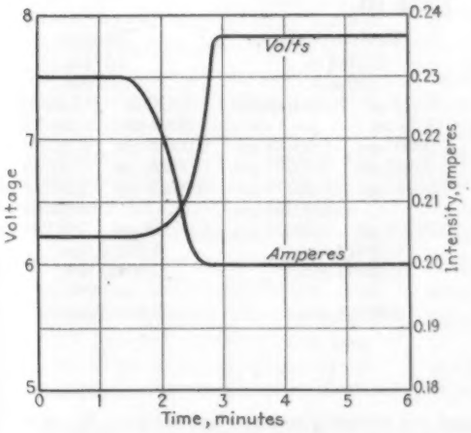


Fig. 1. — Variation of the voltage and amperage during an electrolytical determination of the zinc coating thickness of iron wire. The initial straight lines to the left indicate pure zinc only, the curved portions indicate alloys of zinc and iron, and the straight right portions indicate action on pure iron wire.

Table I. — Readings obtained during the determination of the thickness and character of a zinc coating on iron wire. The wire diameter equals 0.0788 in. and the coating is plated on electrically. Data are from curves in Fig. 1.

Table I

Seconds	Voltage	Amperage	Remarks
0	6.2	0.23	Current on
30	6.2	0.23	Pure zinc layer being dissolved.
60	6.2	0.23	
90	6.25	0.23	Alloy or intermediate layer being dissolved.
120	6.3	0.22	
135	6.5	0.21	
150	6.75	0.20	
160	7.0	0.20	
165	7.25	0.20	
170	7.75	0.20	
175	7.8	0.20	Iron wire exposed; all coating metals dissolved.
205	7.8	0.20	
240	7.8	0.20	
270	7.8	0.20	
300	7.8	0.20	
330	7.8	0.20	
360	7.8	0.20	

Table II

Seconds	Voltage	Amperage	Remarks
0	7.4	0.28	Current on
45	7.5	0.27	Alloy or intermediate layer being dissolved.
60	7.75	0.26	
70	7.8	0.25	
75	8.0	0.25	
85	8.25	0.24	
90	8.4	0.22	
105	8.75	0.22	
115	8.8	0.22	Iron wire exposed; all coating metals dissolved.
120	8.8	0.22	
150	8.8	0.22	
180	8.8	0.22	

Table II.—Readings obtained on zinc coated iron wire. Diameter of wire equals 0.074 in., and the zinc is coated on thermally by the use of a liquid zinc bath. Note that even the extreme outer zinc layer is alloyed with iron.

binary systems, like Fe-Zn for galvanized wires, etc. The total of both percentages of the corresponding metals is obviously 100 per cent and, therefore, only one of the phases needs mathematical consideration. A brief deliberation may assist in clarifying the following deductions. During the first seconds of the electrolytical action upon the gradation zone, the alloy will naturally be rich in the coating metal (zinc in the case of galvanized stock), the concentration of which metal will gradually decrease until it becomes 0 per cent, while the iron as the original phase reaches practically 100 per cent. For galvanized wires the average current intensity of the transition alloys is equal to 0.67 times the original intensity in amperes.

Testing Technique

The apparatus required for practical determinations of coating thickness and characteristics includes a suitable container for the electrolyte, a cylindrical platinum screen electrode, a cathode, a stirring mechanism for the electrolyte, a registering voltmeter, and a registering amperemeter. With this equipment and by following the process as summarized in the foregoing paragraph, the test requires some 5 to 10 min. for its completion.

The original work was carried out by using soft iron wires coated by various thermal and electrical processes with metallic zinc. The electrolyte was a slightly acidified solution of zinc sulphate. From the many series of complete tests with wires galvanized under varying conditions, two examples should amply illustrate the details as well as the practicality of this new method.

In Table I the values from a determination of the characteristics of electrolytically zinc coated wire are presented. These values are taken from the curve shown in Fig. 1. Table II illustrates similar values for thermally zinc coated wire.

A comparison of both series shows the distinct absence of a pure zinc surface layer in the thermally coated sample. This may be explained by the higher rate of thermo-diffusion of zinc at the increased temperature of the liquid zinc bath used in the coating process. The same reason accounts for the much heavier intermediate zone of thermally coated stock. A numerical comparison of both series is presented in Table III.

At present the author is standardizing this experimental method for wire coated with tin, cadmium, copper, nickel, etc.

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Blast Furnace Operation Succinctly Described

AN unusually clear and concise description of the iron blast furnace and its operation, written by T. L. Joseph, has been published by the United States Bureau of Mines in the form of a 29-page mimeographed pamphlet illustrated. It is designated as information circular 6779, and besides its rounded out exposition of the workings of the blast furnace, it essays to cover latest investigations having to do with improving performance, all to the end apparently of helping a prospective builder of a blast furnace plant.

Mr. Joseph styles the blast furnace as "a heat generator, a gas producer, a heat interchanger, a deoxidizing chamber and a melting furnace," and elucidates at length how it fulfils each of these functions. In summarizing, he writes in part as follows:

Trend Toward Ore Concentration

The sizing of ore and the charging of three sizes (medium, fine and course) separately have proved an effective means of obtaining more uniform gas flow, lower fuel consumption and increased output. Such a practice can readily be adopted if about one-half of the ore is larger than ½ in. For the fine ores in the Lake Superior district, steps toward agglomeration will have to accompany sizing of the ore. Segregation of fine concentrates and sintering at the furnaces are steps which have been taken by one company toward better size preparation of the ore.

The physical characteristics of coke have first importance. Coke, which has a low bulk density in the furnace, is very desirable. This implies low ash content, uniformly large pieces with no breeze or small sizes to fill the voids, and maximum porosity without sacrificing resistance to abrasion and to size degradation in han-

(Concluded on page 33)

Table III

Method of Coating Zinc	Electrolytically		Thermally	
Diameter of tested wire	0.0788 in. (2.00 mm.)		0.074 in. (1.88 mm.)	
Length of exposed wire	1.472 in. (3.73 cm.)	Calculated per 1 cm.:	1.420 in. (3.60 cm.)	Calculated per 1 cm.:
Amount of pure zinc	0.00701 gm.	0.00188 gm.	0.00000 gm.	0.00000 gm.
Amount of alloyed zinc	0.00340 gm.	0.00091 gm.	0.00396 gm.	0.00113 gm.
Total zinc, dissolved	0.01041 gm.	0.00279 gm.	0.00396 gm.	0.00113 gm.
Total zinc, by chemical analysis	.....	0.00288 gm.	.....	0.00165 gm.
Amount of iron in alloy zone	0.00290 gm.	0.00078 gm.	0.00338 gm.	0.00094 gm.
Thickness of pure zinc layer	0.00422 mm.		0.00000 mm.	
Thickness of alloy zone	0.00143 mm.		0.00463 mm.	
Total thickness of coating	0.00565 mm.		0.00463 mm.	
Above values obtained from determinations reported in Table No.	I		II	

Table III.—A comparison of electroplated and thermal plated zinc on iron wire. The intermediate layer is much thicker in the case of the thermal coated stock. These data are from graphs as in Fig. 1 and the formula expounded in this article.

Molding 30-in. Cast Sheaves from a 22-in. Pattern

By J. H. EASTHAM

FOUNDRYMEN in general, and those of the jobbing fraternity in particular, are occasionally asked by a customer whose account is considered a valuable one, to do a special favor in the way of producing a few castings which are of larger or smaller size than any available pattern of the design required. The customer's knowledge of the art of molding may be very slight, in some cases not any more than a recognition of the fact that if he stays in a foundry very long he will need a clean collar, so the length of his sojourn is usually governed accordingly.

He has an idea, however, that men who work in sand can alter things to suit themselves, so, consequently, draws a rough dimensional sketch, showing what he would like, and; "you will probably be able to use our such and such pattern, now in your possession; as, this being an exceptional order, with no prospect of a repeat, we do not care to go to any pattern expense, etc., etc." So, when an order was booked for six sheave castings, each 30 in. in diameter, of design shown at Fig. I, from an excellent customer whose office and assembly plant were 40 miles from the foundry receiving the order, an effort to oblige was necessary.

The pattern nearest in size to the castings required measured 22 in. in diameter at the base of the groove, was of plated design, with six strengthening ribs on each side, and six lightening holes as shown, and the castings requested were to follow the same general contours, the hole, however, to be 5 in. in diameter instead of 4 in.

With each of the customer's different sized patterns, numbering about eight in all, a complete circle corebox making a full ringed half core was provided, two half cores thus dried separately, and afterward pasted together, giving accurate results when properly calipered at the time of joining. The patterns were all of metal in one piece, excepting the coreprints, which were of wood, fitted in, to diminish the weight when handling.

As it was first necessary to increase the diameter of the 22-in. pattern plus its outside coreprint to the size required to produce the 30-in.

HOW plaster of paris was used to make extensions in a pattern and core box when a special order was received for a casting larger than that for which any pattern was available is here told in detail. The successful experiment suggests possibilities to the foundryman of applications beyond the realm of only emergency work.

casting, a bed was levelled on the floor approximately 4 ft. square, of ordinary mold hardness, "topped' with fine new molding sand, and struck off in accordance with regular open sand molding practice.

The pattern was then laid centrally on the bed, and a sweep to which a short rim segment was attached, dowel fitted into the center of the hub coreprint, as shown at A, A, Fig. 2.

The segment, set to the radius needed to mark off the diametrical limit of a 30-in. casting, plus the essential gray iron contraction and coreprint allowances, was then passed round the full circle, its outer face being lined up with fine molding sand, backed up with heap sand, rammed level with the top.

A wooden frame of appropriate depth and area placed on the bed minimized the bulk of sand to be handled and rammed. None of the excellent pattern substitutes on the market being available at the moment, plaster of paris was resorted to as the best material for the enlargement, suitable reinforcement being provided by the use of a lacework of round iron rods, several of which were hooped to fit the full circle, their overlapping ends being wired together to prevent their springing open.

Incidentally, the addition of about 3 per cent common salt to the mixture when preparing plaster for a mold dries the material quicker, and renders it more durable.

The sweep removed and the mold cleaned out, the plaster was poured; the rods were added between layers, the mold being filled as quickly as possible to ensure cohesion. The top was then levelled off and slicked flush with the upper face of the orignal pattern groove coreprint, and an extension of some 10 in. was thus added to the pattern's total diameter. Preparation of the mold for the full ring plaster corebox followed the same general lines, the corebox being cast with its face or working side down, radial lines to indicate the inner contours of the corebox being first laid out on the bed by trammels operated from a wedge knocked down in the center of the bed. The inner and outer walls of the mold were

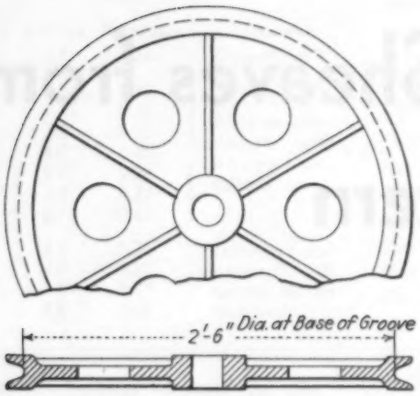


Fig. 1.—Single grooved semi-steel sheave casting 30 in. in diameter made from a 22-in. pattern.

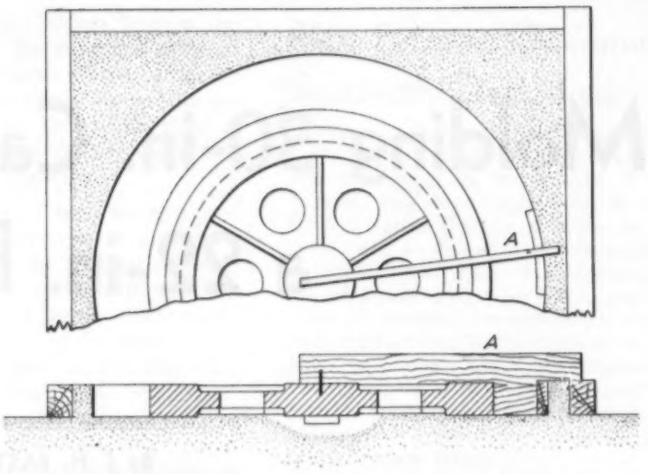


Fig. 2.—Plan and section views of pattern and mold ready for plaster extension to be poured.

then rammed up to a pair of segments, passed round as in the case of the pattern extension.

The groove and print contours were molded from sections of green core made from the 22-in. box, without rods, cut up into short lengths and laid in the mold to the trammelled lines; the slight increase in the radius was effected by means of a small segment cut out on a bandsaw and laid to the line, the cores being then spread easily in their green state by a little judicious tooling on the part of the molder.

The interstices at the ends of the cores were filled in in the usual way; bent wires bridging them at intervals, with their projecting ends pushed down into the bed, prevented the displacement of the cores when the plaster was poured. Extra reinforcement in the way of old nails and cross wires, was added to this unit to enable the corebox to stand better the wear and tear of active operation.

The drawing of the finished corebox shown in Fig. 3, displays the light-looped handles cast in at four points, to facilitate the withdrawal of the box when making the cores. On the same day, six ring coreplates were swept out opensand and cast in iron, the familiar cupola lining block being used as a pattern section, with a ½-in. overhang inside and outside the full width of the corebox to prevent the plaster being chipped during the coremaking operations. The plates were "flowed off" at a ½-in. thickness.

In this connection, when making the groove cores from the plaster equipment, soft ropes, tied at three places around the box and coreplate when rolling them over, were used instead of clamps, for obvious reasons.

When sufficiently dry, the pattern with its plaster extension, also the corebox, were moved from their respective molds, given the necessary "touch up" with a scraper, and shellacked, the six coreplates allowing three full sets of cores to be dried at the same time.

Up to a certain point, the molding of each sheave was a matter of ordinary foundry routine, the pattern, surrounded by its plaster extension, being laid on a flat board, the drag flask rammed up, vented, rolled over, and a parting made, on which the cope was rammed in the usual way. A little extra care was given to the gagger arrangement in view of the fact that after the cope was lifted off, a considerable weight of sand was added in order to extend the plate, ribs, and inner contour of the casting section behind the groove to the required diameter.

This was when the molding process left the commonplace, and was accomplished by the use of a sweep, operated axially from a dowel pin let into a hole in the center of the upper half of the hub pattern, which had been, as is usual, lifted away from the main pattern with the cope half of the mold.

As a means of extending the six ribs in both cope and drag, two loose ribs extending from the periphery of the hub to the shoulder of the new diameter, were dropped into the rib

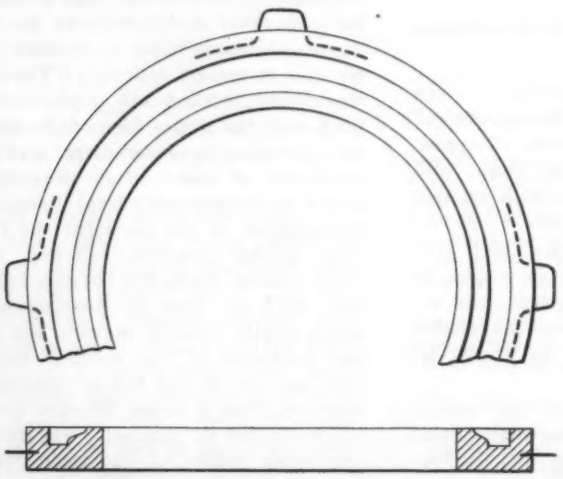


Fig. 3.—Plaster core box for sheave 30 in. in diameter (at Left).

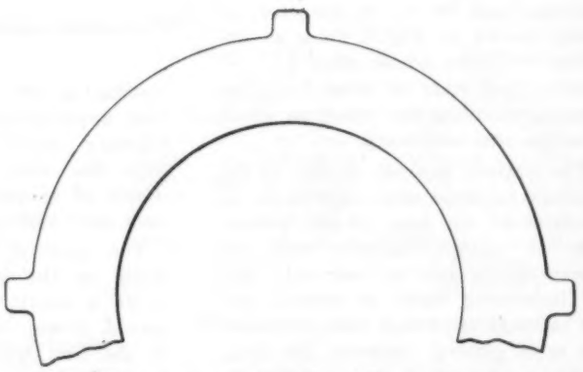


Fig. 4.—Ring-type, cast coreplate ½ in. thick to maintain lightness.

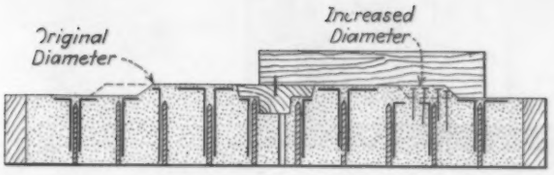


Fig. 5.—Cope half of mold with sweep in position, showing increased diameter at right, original mold as parted at left.

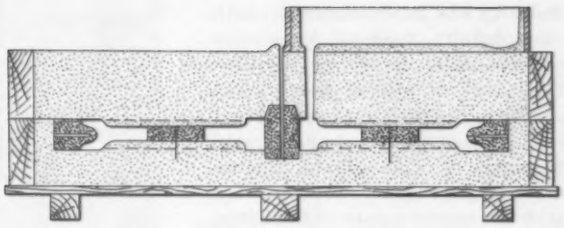


Fig. 6.—Cross section view of closed mold for 30-in. diameter sheave.

slots, the face of the original mold in the area to be built up being then roughed up with a trowel so as to hold the facing sand pressed into the space between the ribs. The sweep was then pushed around, the built-up area was next nailed to remove any risk of a drop when the mold was finally closed.

Continuing this operation, the ribs were moved round, one at a time, alternately, until the circle was completed, the outer ends of the rib sticks forming an excellent preliminary guide for the molder when building up the sand before operating the sweep. The cope mold, with sweep in position at the right, and the mold as it appeared when hoisted off shown at the left, as well as the nails necessary to carry the extra load, are shown in Fig. 5.

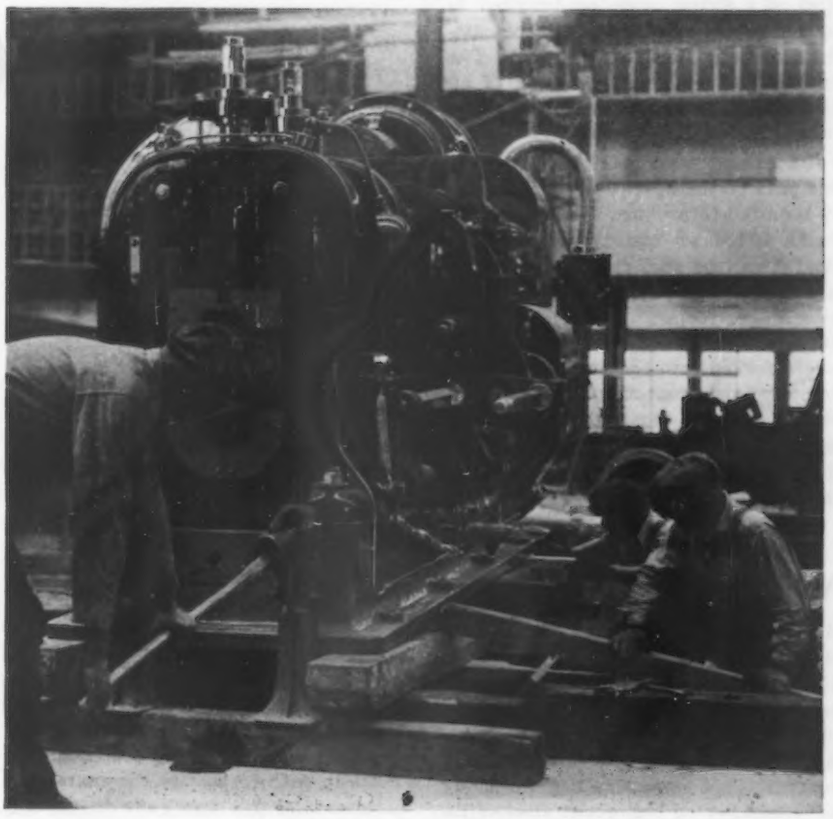
The diametrical extension completed, the sweep was removed, the hub pattern drawn, and the mold given the few necessary finishing touches before plumbago coating and slicking. Alterations to the drag mold were carried out in exactly the same way as soon as the main pattern was drawn, a hole in the center of the lower hub pattern forming the pivotal point as in the case of the cope; the nails, however, were omitted after the filling in process as being unnecessary.

The original prints intended to receive the cores to form the lightening holes, left by the pattern, were filled up level with the face of the mold. The new equidistant locations were marked off, and circular flat cores 5 in. in diameter were set to position. A nail pushed through a hole in the center of each, in addition to the cope touch, held them firmly in place when the castings were poured.

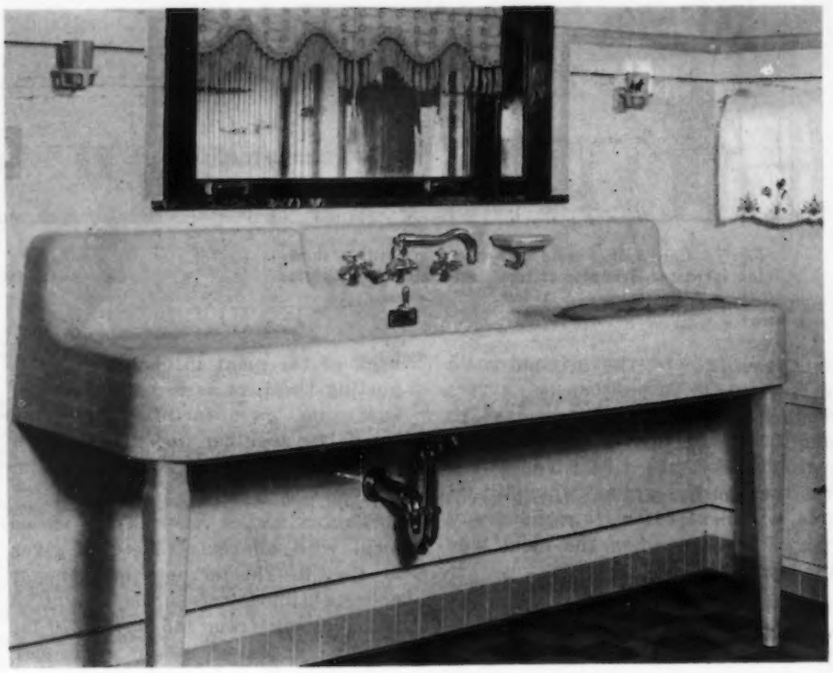
The actual coremaking from the plaster corebox needed a little extra precaution when placing the rods, and to jar the cores a little before withdrawing the box the under side of the coreplate was rapped lightly instead of striking the box, this, of course, to avoid breaking the plaster. Sand cut away at four places on the back of the print in each half when pasting them, so as to bare the outer iron ring, gave facilities for tying the halves together and also to lower them into the molds without risk of breakage.

A cross section view of the closed mold with all cores placed is given at Fig. 6. The increase in diameter above outlined, raised the weight of each casting from 145 lb. to 270 lb., a gain in selling weight of around 750 lb. on the order of six, delivered by mutual agreement six days after receipt of the customer's instructions.

The net gain, apart from the reasonable cash profit, was, six handy coreplates to be added to the general coreroom equipment, and, which was much more important, a considerable increase in the goodwill of the customer toward the foundryman concerned, as the result of his willingness to oblige.



THE full-size brass rolling mill here shown being moved on its concrete foundation by a crew from the American Brass Co., Waterbury, Conn., will be a feature of the Ford exhibit at the Century of Progress Exposition, which opened at Chicago, May 26. Capable of producing at the rate of more than 25,000 lb. of sheet brass daily, the mill will be in continuous operation.



Wet and Dry

By LeROY W. ALLISON

THE advances in the art of enameling iron and steel and the growth of the enameling industry were traced in some detail by the

REFERRING to the sanitary ware industry and its development, with the definite fund of knowledge and information procured through iron and steel, as well as metal-working practice, a remarkable change and growth ensued in a comparatively short period of time. Plant layouts were rearranged to provide for straight-line manufacture of bath tubs and other fixtures from pattern shop to finished storage and shipping.

Cast Iron Enameling

In the modern cast iron enameling plant, the castings are conveyed mechanically to the shaking pits, where the material is freed from the molding sand, conveyed to automatic sand blasters and thence to the pickling baths. After leaving this bath, a grip or ground coat enamel is applied to the castings, which are then placed in the enameling furnace by means of large iron forks. At red heat, the enamel melts and flows into a smooth, glassy surface. At this point the tub castings are removed from the furnace and the enamel finishing coat applied. The latter operation is handled on a swivel table, so designed as to permit the worker to turn the castings in any desired position. The enamel is dusted on by means of an electrically tamped sieve on the end of a long rod.

Experience and good judgment on the part of the operative are naturally required to produce the fine enamel finish noted on quality ware today. And it can be said further that such a finish never would have been possible under former methods of manufacture. Following, the tub castings are reforked into the furnace and the top or finish coat of enamel melted down. Several top coats are usually applied to ware, and always to best grade ware, to give proper depth and desired quality of finish.

Sheet Steel Enameling

WITH cast iron enameling established on a more or less well-defined basis of improved technique, using the so-called dry process, as outlined, the next development and a natural one has been the porcelain enameling of sheet steel. Rapid strides have been made in this line in recent months. The research organizations of a number of important steel mills have given thorough investigation to the specific problems imposed by enameling operations for the production of sheet steel to answer the requirements.

Giving a direct slant on the possibilities of steel enameling for different commercial products, the automobile industry has been demonstrating constantly the intricate and complicated shapes that can be produced by the highly perfected pressing and stamping machines. Further, in other lines, the development of greater skill in deep drawing, as well as the progress made in welding, served to make it logical and practical to consider the enameling of numerous articles entirely out of question with cast iron.

In course of natural procedure, it has become more and more understood that products should be designed specifically with respect to the enameling process and this has gone to expand and enhance the field of manufacture of steel-enameled specialties. There have been frequent instances of products giving unsatisfactory results when enameled, later determined as caused by improper basic design for such type of finish.

A typical example of the latter might be cited in the case of tubs for washing machines, formerly made with welded barrel and bottom. When painted, this construction proved quite satisfactory, but when it was decided for sales reasons to give a porcelain enamel finish to the tub units, the initial results were quite the reverse. This led to a new design of tub, now produced generally in one-piece drawn steel construction, perfectly suited to the porcelain enameling operation. The importance of proper design from the standpoint of the enameling plant is quite well recognized in the indus-

OF these two views of enameled sinks the one immediately above is of a steel sink made by the Youngstown Pressed Steel Co., and that on the facing page is one of cast iron.

▲ ▲ ▲

Processes of Enameling

and MALCOLM B. CATLIN

authors in the issue of June 21. The accompanying article is devoted to the enameling of both cast iron and steel.

try itself, although the enamel jobbing plant engaging for a variety of outside interests constantly receives orders to enamel products obviously not at all suited to such type of finishing process.

Nothing seems to illustrate more clearly the importance of the power press to the enameling field of today and the future than the development of the pressed steel sink. This now highly successful line of manufacture is of comparatively recent origin, but of sufficient extent to demonstrate forcibly the progress being made in the use of what is known as wet process enameling on steel.

Two prominent manufacturers have entered into the production of such sink units under mass methods of output, the Youngstown Pressed Steel Co., Warren, Ohio, and the Briggs Mfg. Co., Detroit. This accomplishment is the inevitable step in manufacturing evolution toward a perfected product of minimum material and weight to perform a given function with entire satisfaction, and will doubtless be followed by other equally striking examples in the future.

Developments are in progress for a vitreous enameled steel bath tub pressed from a single steel sheet, while lavatories of similar base metal and finish are in early prospect. Both of these units, it is understood, will average 50 to 65 per cent lighter in weight than the conventional cast iron sanitary fixtures now on the market. That this will lead to the production of similar large products of steel-enamel in other lines is certain. The possibilities seem practically limitless.

Within the past year, close to 100,000 pressed steel enameled sinks are said to have been made and placed in service. These units are about 30 per cent lighter than corresponding sinks of enameled cast iron today, and easily 50 per cent of the weight of latter type sinks of 20 or more years ago. This reduced weight is pointed out as a definite advantage in connection with freight or other transportation charges, as well as handling and installation on the job. With reduced manufacturing costs, as in the case of the pressed steel sink, comes a lower price level in marketing, and this seems destined to have its effect on the cast iron unit. Further, it is safe to predict that inroads will be made on the sales of the heavy all-clay fixtures of similar character.

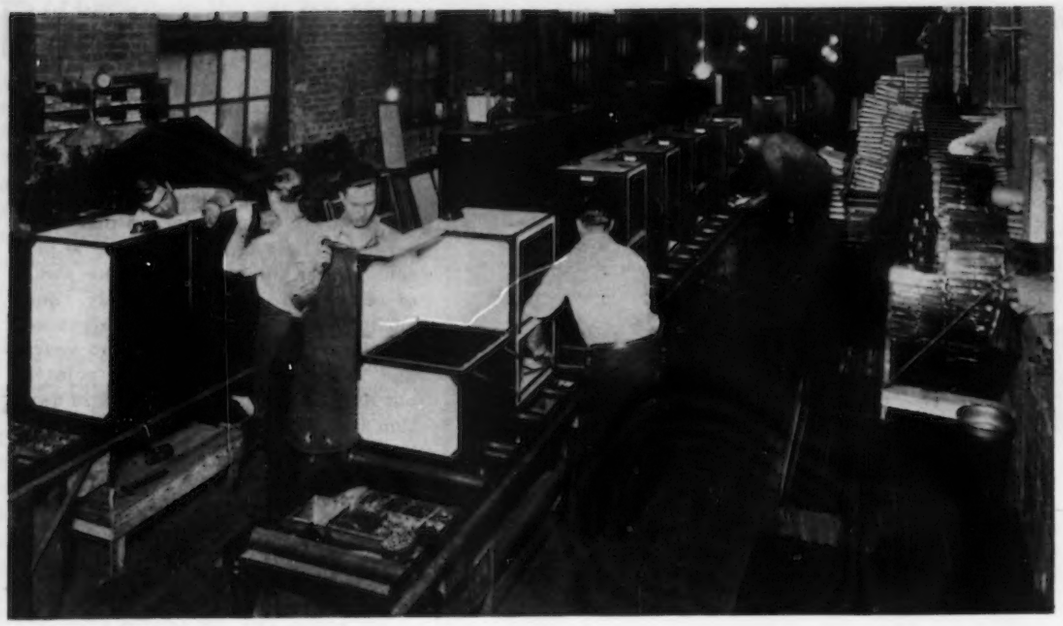
A Modern Sheet Steel Enameling Plant

THE plant of the Youngstown Pressed Steel Co. is a model of its kind for sheet steel vitreous enameling service. This company is prominent for its extensive production of pressed steel parts of numerous variety. Likewise, it is an important factor in the manufacture of enameled washing machine tubs, producing about 70 per cent of the entire output of such units. Pressed steel enameled sinks have come as a natural development in the further utilization of plant equipment and facilities.

The press department consists of a large battery of heavy presses, the largest unit, resting on a 16-ft. concrete foundation, weighing 160 tons and having a ram pressure of 1500 tons. With this press it is possible to draw steel up to 27 in. in depth. The machine has a normal rated capacity of about 240 units per hr. Washing machine tubs or steel sinks, as the case may be, are drawn in one operation. Bending, turning, perforating and other special features of design or operation are handled on the smaller presses in the shop.

Washing machine tubs, averaging 12 to 16 in. deep, are produced with ease, precision and speed from single steel sheets of 18-gage material, and likewise steel sinks, of appreciably less depth, but running up to 60 in. long, from 14-gage steel sheets. The fabrication is carried out entirely in one piece, with no welds or seams of any kind.

There is a large pickling and clean-



HERE are enameled parts being assembled into gas stoves on roller tables in the plant of the American Stove Co.

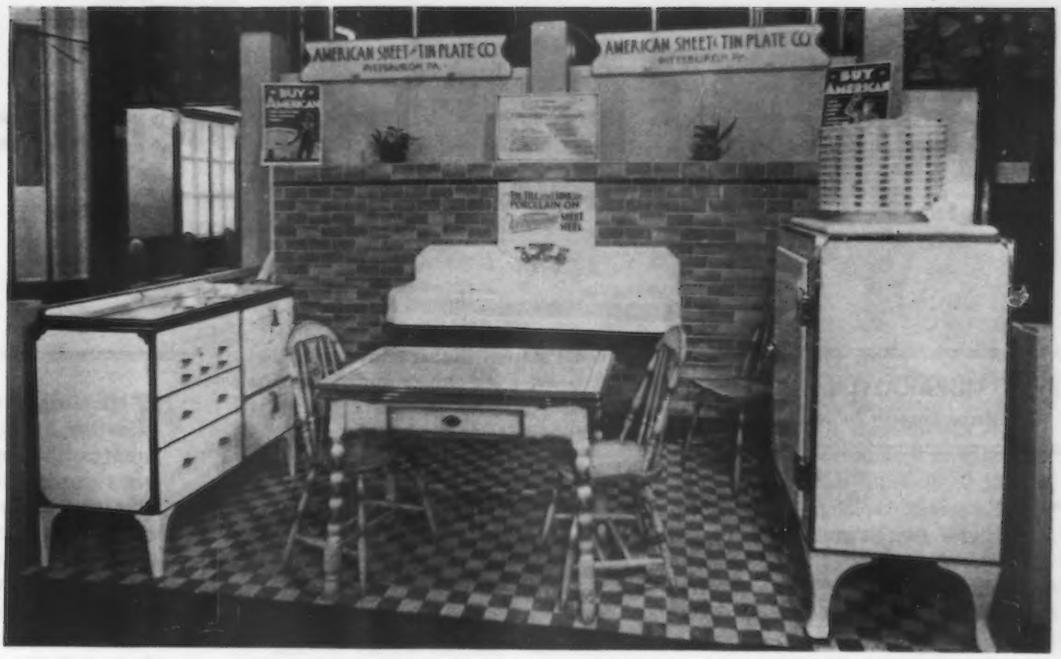
ing department at this plant, with a battery of seven rubber-lined tanks. Under normal production schedules, the steel sheets are cleaned and pickled during the night, ready the next morning for cutting and press handling.

The enameling plant is of continuous type, said to be the largest such plant of its kind in existence, with a rated capacity of 2500 units per day. This department of the Warren plant represents an investment of about $250,000. Mechanical conveyors are installed for every feature of operation. The furnace installation consists of one U-type, electric-operated continuous unit, with a total routing length of 160 ft., from the time the material enters on one side and leaves on the other side. The baskets or hangers carrying the products to be enameled move at the rate of 10 ft. per min., and are actually in the furnace about 20 min. The unit operates at 1600 deg. C., in the firing zone. A regular box-type enameling furnace recently has been installed in the plant to handle overflow material to be enameled.

Two production lines have been arranged in the enameling division, making possible the enameling of two separate products, such as pressed steel sinks and washing machine tubs, at the same time. This is a special feature of the plant and makes for noticeable economy in manufacture. The products pass through four times for one ground coat of enamel, two coats of white enamel, and for an acid-resisting coat respectively. The latter provides an acid-resisting porcelain enamel finish of exceptionally high quality. The pressed steel sinks are enameled all over and underneath, as compared with the conventional sinks painted underneath.

About 20 different models of these steel sinks are now being marketed by the company direct to plumbing material jobbers in all parts of the country. The finished sink units range in size from a 60-in. double drainboard to 16 x 24 in. flat rim sink, without drainboard. The flanges on the sinks are turned under so that no rough edges will be exposed. These sinks are sold under the trade name VEOS, formed from the type of production, or vitreous enamel on steel. The sinks are being enameled in white only at the present time, with plans well developed to manufacture the units in a number of attractive colors at a later date, these corresponding to the popular color shades of the day. Special pressed steel brackets have

ENAMELED parts are carried by conveyor into a gas fired enameling furnace in the plant of the American Stove Co.



THE vogue of enameling in the kitchen is shown by the enameled range, sink, table top and refrigerator.

been designed to hang the sinks from the wall in installations.

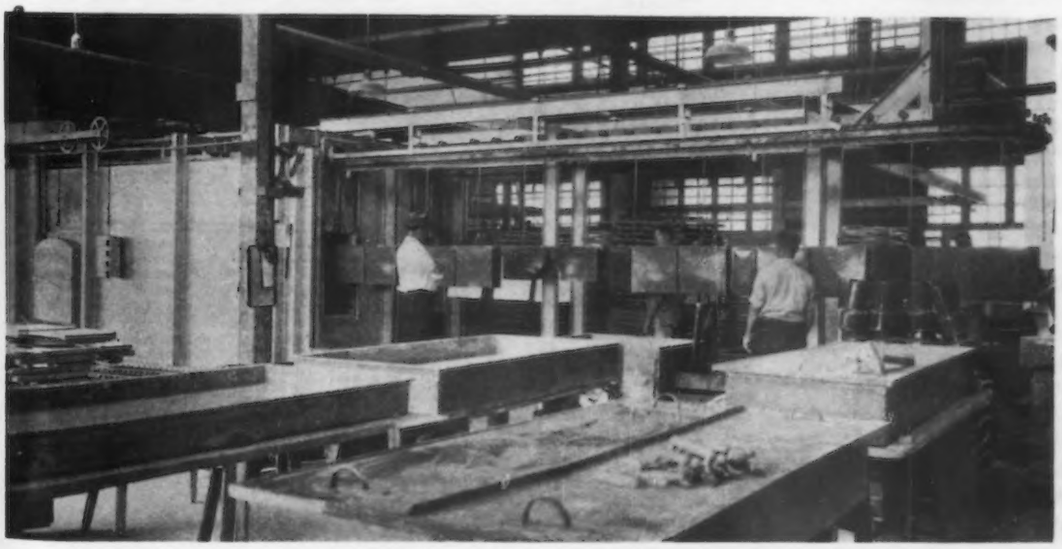
Enameling Development

WHILE the importance of the iron and steel industry to the porcelain enameling field has been emphasized in this article, the great advance in the quality and durability of enamel finish during the same time, brought about through the ingenuity, skill and research of enamel chemists, is worthy of particular mention. This work has been a primary factor in developing porcelain enamel to its present popularity.

This phase of the improvement may be traced to a noticeable extent to the progress made in glass chemistry in the past two or three decades, for as previously stated, enamels literally are nothing more than special types of glasses. The modern knowledge and insight regarding the nature of glass has made it possible for the enameling plant to apply scientific methods to the basic problem of definite and absolute adherence of the non-expanding glass to the expanding metal base.

Long ago those skilled in enameling recognized the great advantage of mechanization and close control in the compounding and melting of enamel batches, or frit, and today a well-operated enameling plant is a fine object lesson in real technical efficiency. The recent advances made in the field of colored enamels have brought about some notable results in this direction, securing increased attention to the artistic flexibility of enamel finishes. Here again research and experiments have taken a leading part in the devlopment. Architects, among others, have been attracted by the possibilities of the mass-produced enamel-steel units, in large or small sizes, as the case might be, and in plain or decorated patterns.

The late developments in acid-resistant enamels, likewise, has expanded the range of application of the material, eliminating at the same time a previous objection to enamel finish under certain conditions of service. Various kinds of textured enamels, wood-grain effects, marbleized finishes and the like, all tend to emphasize the adaptability and future encouraging prospects in this versatile field, so closely identified with the iron and steel industry.



SHEETS taken from the dipping tanks are passed into the furnace units as here shown.

Effect of Heat Treatments on the

By T. MURAKAMI and A. HATTA
Tohoku Imperial University, Japan

THE variations of physical properties by different heat treatments of commonly used die steels are recorded herein in detail. The investigators not only have determined the transformation points and hardness values of the steels but have extended their investigation to include abrasion losses, impact values at high and low temperatures, and a determination of the softening point of the steels. As these data are taken

THE recent developments of industries have greatly increased the requirements of tool steels and multiplied the kinds of steels used for dies. These types of steels are widely used for drawing, forming, extrusion, punching, etc., and the following properties are generally required: (1) intense hardness without brittleness, (2) extremely high resistance to abrasion, (3) comparative ease of machining in the annealed state, (4) minimum dimensional change and distortion during quenching and (5) retention of the required mechanical properties at high temperatures. Since it is difficult to obtain such a variety of properties with carbon steel there has necessarily been a development of steels containing chromium or tungsten for die purposes. For many die steels the carbon content is as high as about 2 per cent, and among the alloy steels high-chromium high-carbon steels are most widely employed.

In spite of the fact that there are numerous kinds of die steels, there have been very few studies made concerning their properties. The present authors carried out comparative studies on the change of properties due to the heat treatment of six commercial die steels. The change of the transformation points according to the cooling rate was studied by means of magnetic analyses and differential dilatometric measurements. Further, the abrasion and hardness tests were made on heat treated steels. As forming and extrusion dies are often used at a high temperature, and the temperature of die steel rises considerably due to the friction even with cold working, the impact hardness and impact tests were also conducted at high temperatures.

In this investigation six commercial die steels were used. Table 1 shows the chemical analyses of these steels: No. 1 is a high-carbon steel, No. 2 low-chromium high-carbon steel, Nos. 3 to 5 are high-chromium high-carbon steels, and No. 6 is a tungsten-chromium steel.

An investigation was made concerning the changes of transformation points due to maximum heating temperatures and cooling rates by means of magnetic analyses. The results of these experiments are tabulated in Table 2. The high-carbon steel (specimen No. 1) shows A_1 and A_0 transformations, but these points scarcely change as the heating temperature rises, whereas they fall slightly as the cooling rate increases. With the low-chromium high-carbon steel (specimen No. 2), only the Ar_1 transformation appears in the case of furnace cooling, whereas in the case of air cooling the Ar_0 transformation appears below 100 deg. C. In general the transformation temperatures fall slightly with the increase of the cooling rate and the rise of the heating temperature. In high-chromium high-carbon steels, such as specimens Nos. 3 to 5, each one shows by slow heating an Ac_2 point at about 750 deg. which is lower than the Ac_1 point, but in the case of furnace cooling the Ar_2 and Ar_1 transformations overlap each other and occur at 740 to 700 deg. and fall as the heating temperature rises. Comparing the results of air cooling from 900 deg., in specimens Nos. 3 to 5, it was found that in specimen No. 3 a large Ar' transformation is due to the lower carbon content as compared to the others, and in specimen No. 5 the absence of Ar' is due to the high content of chromium and carbon. Tungsten-chromium steel, as in specimen No. 6, shows Ar_1 and Ar'' transformations when furnace cooled from 1000 deg. and 1100 deg., while it markedly shows an Ar'' transformation when air cooled; this latter temperature falls as the heating temperature rises. It is obvious, therefore, that the effect of the heating temperature and cooling rate on the transformation points is very slight in high-carbon steel and low-chromium high-carbon steel, but it is very conspicuous in high-chro-

TABLE 1

Specimen No.	Composition, Per Cent				
	C	Cr	Mn	Si	W
No. 1...	2.31	...	0.58	0.12	...
No 2...	1.91	1.56	0.43	0.31	...
No. 3...	1.83	12.21	0.36	0.46	...
No. 4...	1.98	12.64	0.26	0.91	...
No. 5...	2.71	14.35	0.40	0.25	...
No. 6...	1.59	1.77	1.10	0.75	8.14

TABLE 2

Specimen No.	Transformation Point, Deg. C.						
	Slowly Heated	Furnace-Cooled From 900 Deg. C.	Furnace-Cooled From 1000 Deg. C.	Furnace-Cooled From 1100 Deg C.	Air-Cooled From 900 Deg. C.	Air-Cooled From 1000 Deg. C.	Air-Cooled From 1100 Deg C.
No. 1.....	742(Ac_1) 200(Ac_0)	675(Ar_1) 150(Ar_0)	675(Ar_1) 150(Ar_0)	575(Ar') 100(Ar_0)	575(Ar') 100(Ar_0)	575(Ar') 100(Ar_0)	575(Ar') 100(Ar_0)
No. 2.....	746(Ac_1)	705(Ar_1)	695(Ar_1)	686(Ar_1)	550(Ar') 100(Ar_0)	500(Ar') 100(Ar_0)	450(Ar') 100(Ar_0)
No. 3.....	750(Ac_2)	740(Ar_1)	724(Ar_1)	718(Ar_1)	560(Ar') 326(Ar'')	550(Ar') 150(Ar'')	500(Ar') 100(Ar'')
No. 4.....	747(Ac_2)	725(Ar_1)	725(Ar_1)	690(Ar_1)	650(Ar') 250(Ar'')	400(Ar') 750(Ar'')	125(Ar'')
No. 5.....	755(Ac_2)	740(Ar_1)	730(Ar_1)	700(Ar_1)	550(Ar') 150(Ar'')	500(Ar') 150(Ar'')	500(Ar') 150(Ar'')
No. 6.....	763(Ac_1)	675(Ar_1)	655(Ar_1) 200(Ar'')	650(Ar_1) 200(Ar'')	600(Ar') 150(Ar'')	550(Ar') 125(Ar'')	550(Ar') 100(Ar'')

Properties of Die Steels

under conditions approximating those of actual operation the tables should be of considerable value to die makers to enable them to more confidently determine specific treatments for particular operation requirements. This investigation was made at the Tohoku Imperial University and the data herein are a rearrangement and abridgment of a paper which appeared in the Science Reports of that University

mium high-carbon and tungsten- chromium steel.

Since by magnetic analyses it is impossible to determine the A_1 transformation point when, as in the case of high-chromium high-carbon steel, the A_2 point is lower than the A_1 point, the method of differential dilatometry was employed to determine the A_1 points for the various steels considered in this investigation. The results of these tests are shown in Table 3.

Variation of Hardness

In order to study hardness variations due to heat treatment, the specimens were tested with respect to heating temperature, cooling rate, tempering temperature and tempering time. The specimens were heated at 900 deg., 1000 deg., 1100 deg., and 1150 deg. C. (especially for specimens Nos. 3 to 5), and furnace-cooled, air-cooled or oil-quenched after they had been kept for 1 hr. in a vacuum at each of the temperatures mentioned above. The tempering also was carried out in a vacuum, and the temperature was varied from 100 to 600 deg. in 100-deg. steps and the time for 10, 20, 40 and 60 min. The specimens were air-cooled after each tempering. In addition, each die steel was annealed at 650, 700, 750, 800, 850, 900 and 1000 deg. after being furnace-cooled from 900 deg. and the hardness measured in order to study the respective softening temperatures. A Rockwell hardness tester with a diamond cone using a load of 150 kg. was used for these measurements.

In Table 4 there are shown the results obtained on the specimen in measuring the change of hardness due to the heating temperature and cooling rate. From these results it can be seen that the effect of the heating temperature is slight for furnace- and air-cooling, and as the heating temperature rises the hardness increases by a small amount. In the case of oil-quenching, however, the effect is very remarkable. Both for furnace-cooling and air-cooling each specimen shows that the higher the heating temperature the greater the hardness number. This is caused by the fact that the normal transformation incurs difficulty whereas martensite is easily formed at the Ar'' transformation point as the heating temperature rises. In oil-quenching the decrease of hardness, except for high-carbon steel, on heating to above certain temperatures results from the increase of residual austenite. Therefore it should be noticed when studying the effect of the cooling rate that the hardness is not always high with a rapidly cooled specimen; further, the hardness of the air-cooled specimen is always higher than that of the furnace-cooled, while in the case of the specimen oil-quenched from above 1000 deg. the hardness is lower than that of both the air- and furnace-cooled specimens.

In order to study the influence of tempering, the hardness changes were examined in specimens that had been tempered at different temperatures for various times after they had been air- or oil-quenched from a range of temperatures. The results are shown in Tables 5 and 6. Other results obtained but not shown in these tables can be summarized in the following manner.

In general the specimens tempered after air-cooling scarcely changed their hardness, excepting specimen No. 6 which decreased with a rise of the tempering temperature. The hardness of oil-quenched specimens markedly changes as a result of tempering. Specimens No. 1 (high-carbon steel) and No. 2 (low-chromium high-carbon steel), oil-quenched from 900 deg., increase in hardness by tempering at 100 deg., and the hardness of the other steels gradually decreases as the tempering temperature rises. The increasing of hardness by tempering at 100 deg. is due to the transformation of alpha-martensite into beta-martensite. In oil-quenching from 1000 deg. specimens Nos. 3 to 5 (high-carbon high-chromium steels) decrease in hardness as the tempering rises, but specimens No. 1 (high-carbon steel) and No. 2 (low-chromium high-carbon steel) increase in hardness by tempering at 100 deg., as in the case of oil-quenched specimens from 900 deg. Specimen No. 6 (tungsten-chromium steel) decreases in

TABLE 3

Specimen No.	A_1 Transformation Point, Deg. C. Slowly Heated	Slowly Cooled
No. 1.....	735~765	708~650
No. 2.....	736~785	730~692
No. 3.....	795~825	766~725
No. 4.....	791~848	810~725
No. 5.....	791~850	810~725
No. 6.....	735~765	738~680

TABLE 4

Heat Treatment	Rockwell Hardness (C-Scale) Specimen No. No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Furnace-cooled from 900 deg.....	40.3	41.5	39.3	38.3	38.0	48.3
Furnace-cooled from 1000 deg.....	41.6	43.2	41.6	40.2	38.3	49.1
Furnace-cooled from 1100 deg.....	39.1	48.3	42.6	41.1	42.3	52.3
Air-cooled from 900 deg.....	42.5	45.3	42.6	42.5	40.7	56.4
Air-cooled from 1000 deg.....	43.6	47.2	46.6	47.6	48.4	61.4
Air-cooled from 1100 deg.....	46.3	49.0	46.8	48.6	48.2	62.4
Oil-quenched from 900 deg.....	56.3	68.0	65.4	63.3	63.1	65.3
Oil-quenched from 1000 deg.....	59.1	60.0	68.3	64.2	66.7	54.0
Oil-quenched from 1100 deg.....	58.5	43.8	62.7	58.1	60.7	44.5
Oil-quenched from 1150 deg.....	...	...	51.2	48.6	48.5	...

hardness by tempering at 100 and 200 deg., but its value markedly increases by tempering above 500 deg. This phenomenon is attributed to the decomposition of residual austenite into martensite. In oil-quenching from 1100 deg. the hardness of specimens differs from each other. In sample No. 1 (high-carbon steel) an increase in hardness by tempering at 300 deg. is attributed to a decomposition of residual austenite into martensite. Specimens Nos. 3 to 5 (high-chromium high-carbon steels) gradually decrease in hardness until the tempering temperature reaches 400 deg., but the values slightly increase at 500 deg. Specimens No. 2 (low-chromium high-carbon steel) and No. 6 (tungsten-chromium steel) show low hardness values until the tempering temperature reaches 300 and 500 deg. respectively, but increase considerably above these temperatures. This effect is also attributed to the decomposition of residual austenite into martensite. A study was then made on the change of hardness in high-chromium high-carbon steels caused by tempering of specimens oil-quenched from 1150 deg. C. The hardness values were found to be low until the tempering temperature reaches 400 deg., but the values rapidly increase at 500 deg. This is also attributed to the same reason as stated above.

The influence of tempering time is shown in Tables 5 and 6; in the case of air-cooled specimens, the hardness values scarcely change when the tempering time is increased more than 10 min., but oil-quenched specimens differ greatly from each other according to the specimen and the heating temperature applied. In specimen No. 1 (carbon steel) the oil-quenching from 900 deg. increases the hardness with the increase of time when tempering at 100 deg. for the first 30 min., but it becomes constant with any further increase of time. The hardness increases by tempering at 200 and 300 deg. for 10 min., but it decreases at 20 min. and then becomes constant with an increase of time. By tempering at 500 and 600 deg. the hardness does not increase at first but it becomes constant by tempering for 20 min. at 500 deg. and 10 min. at 600 deg.

The specimens oil-quenched from 1000 and 1100 deg. increase in hardness when tempered at 500 deg. for 10 min., but the hardness becomes constant after the time exceeds 20 min. In the case of tempering at 600 deg. the hardness decreases in 10 min. and thereafter becomes constant.

In oil-quenching from 900 deg., the hardness of specimen No. 2 (low-chromium high-carbon steel) does not change greatly with the increase of tempering time at 100 deg., but the hardness decreases by tempering at 200 to 500 deg. up to 20 min., and at 600 deg. up to 10 min. thereafter being constant. In the case of oil-quenching from 1000 deg., the hardness increases slightly by tempering at 100 and 200 deg. for 20 min., but no change is perceptible by tempering at 300 and 400 deg., and by tempering at 500 deg. it decreases until it reaches 40 min., whereas by tempering at 600 deg. it decreases in 10 min. and becomes constant afterward. For the specimens oil-quenched from 1100 deg. the tendency differs from those of other heat treatments. The change of hardness due to the tempering time can not be observed at 100, 200 and 300 deg. By tempering at 400 deg. the hardness does not change in 10 min. but it increases remarkably in 20 min. and thereafter it becomes constant. In the case of tempering at 500 and 600 deg. the hardness becomes constant after it increased in the first 10 min.

On the hardness of specimens Nos. 3 to 5 (high-carbon high-chromium steels) the effects of the tempering times quite resemble each other. The hardness of the specimens oil-quenched from 900 deg. does not change by the tempering time at 100 and 200 deg., but by tempering at 300 to 600 deg. it decreases in 10 min. and becomes constant thereafter. It

TABLE 5
Rockwell Hardness (C-Scale)

Heat Treatment				Specimen No.					
Heating Temp., Deg. C.	Cooling Method	Tempering Temp., Deg. C.	Tempering Time (Min.)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
900	Air-cooled	100	10	42.0	45.4	42.2	42.5	41.9	56.6
900	Air-cooled	100	30	42.9	45.6	40.1	41.9	43.0	56.6
900	Air-cooled	100	70	42.9	45.3	40.3	41.6	43.0	61.0
900	Air-cooled	200	10	43.0	44.4	41.0	40.3	41.8	59.4
900	Air-cooled	200	20	44.6	44.6	41.7	40.9	42.0	59.3
900	Air-cooled	200	40	44.0	44.6	41.4	40.1	42.8	60.0
900	Air-cooled	200	60	43.7	44.6	41.6	40.5	42.8	59.5
900	Air-cooled	300	10	42.1	44.0	43.7	42.6	42.1	58.0
900	Air-cooled	300	20	43.0	44.0	44.0	43.4	42.7	57.6
900	Air-cooled	300	40	43.2	44.5	43.8	43.1	42.4	56.6
900	Air-cooled	300	60	43.4	44.4	44.6	43.6	43.1	58.0
900	Air-cooled	400	10	43.6	45.1	42.3	42.0	41.6	55.0
900	Air-coloed	400	20	43.8	45.5	43.0	42.0	42.1	55.6
900	Air-cooled	400	40	44.0	45.2	43.4	42.1	42.4	56.8
900	Air-cooled	400	60	44.4	44.5	42.6	42.3	42.3	55.1
900	Air-cooled	500	10	43.8	44.4	42.8	41.8	42.4	51.0
900	Air-cooled	500	20	43.2	44.2	43.1	40.8	42.6	51.0
900	Air-cooled	500	40	43.1	43.8	41.6	40.5	42.0	50.6
900	Air-cooled	500	60	43.1	43.0	42.1	40.9	42.2	50.1
900	Air-cooled	600	10	43.3	43.6	41.0	41.5	42.1	53.0
900	Air-cooled	600	20	42.9	43.5	39.4	40.2	43.5	50.5
900	Air-cooled	600	40	43.4	43.6	40.3	40.2	41.6	51.4
900	Air-cooled	600	60	43.3	43.2	40.7	40.3	42.2	49.5
1000	Air-cooled	100	10	44.5	46.5	46.0	45.8	49.1	61.4
1000	Air-cooled	100	30	44.5	46.6	46.4	45.8	49.2	61.6
1000	Air-cooled	100	70	44.5	46.3	46.5	45.6	49.2	61.0
1000	Air-cooled	200	10	44.4	45.5	46.8	46.3	48.5	61.0
1000	Air-cooled	200	20	44.0	46.0	47.2	46.2	48.7	60.7
1000	Air-cooled	200	40	43.2	46.2	46.6	45.6	48.9	60.3
1000	Air-cooled	200	60	45.0	46.5	46.5	45.6	50.6	59.5
1000	Air-cooled	300	10	44.1	47.0	46.4	45.0	49.3	59.1
1000	Air-cooled	300	20	43.5	46.1	45.3	44.6	50.8	58.7
1000	Air-cooled	300	40	44.7	46.7	47.1	45.4	49.3	59.1
1000	Air-cooled	300	60	44.8	47.0	46.6	45.3	49.7	57.7
1000	Air-cooled	400	10	43.6	47.1	47.4	48.0	48.6	58.4
1000	Air-cooled	400	20	44.0	47.4	46.3	48.4	49.3	58.6
1000	Air-cooled	400	40	44.1	47.1	47.4	48.0	48.8	58.5
1000	Air-cooled	400	60	44.5	47.3	47.2	47.8	49.0	58.6
1000	Air-cooled	500	10	43.5	45.6	45.6	46.4	49.0	56.1
1000	Air-cooled	500	20	45.0	45.4	46.2	46.5	49.5	56.5
1000	Air-cooled	500	40	43.8	45.4	45.5	45.4	49.3	56.2
1000	Air-cooled	500	60	43.5	45.6	46.5	46.2	49.8	56.2
1000	Air-cooled	600	10	44.1	47.2	46.0	45.1	48.8	55.1
1000	Air-cooled	600	20	43.2	46.8	45.0	45.1	49.0	54.4
1000	Air-cooled	600	40	44.0	47.0	45.1	45.0	49.2	55.7
1000	Air-cooled	600	60	44.2	46.4	45.5	44.8	48.7	53.5
1100	Air-cooled	100	10	46.5	49.3	48.0	48.8	49.5	62.0
1100	Air-cooled	100	30	46.5	49.0	48.4	49.0	49.9	62.6
1100	Air-cooled	100	70	46.2	49.7	48.5	49.0	49.8	62.0
1100	Air-cooled	200	10	45.0	49.8	47.3	49.5	48.6	62.3
1100	Air-cooled	200	20	45.6	49.7	47.4	49.4	48.5	60.6
1100	Air-cooled	200	40	46.0	51.1	47.8	49.8	49.0	61.6
1100	Air-cooled	200	60	46.3	51.0	47.2	49.6	50.1	62.1
1100	Air-cooled	300	10	47.3	50.2	47.0	49.1	47.9	61.1
1100	Air-cooled	300	20	47.1	50.5	47.3	50.0	48.9	60.2
1100	Air-cooled	300	40	47.7	51.1	47.7	50.8	48.8	59.9
1100	Air-cooled	300	60	47.5	50.8	48.2	49.2	48.6	59.5
1100	Air-cooled	400	10	45.6	49.5	47.5	47.4	49.3	60.3
1100	Air-cooled	400	20	45.6	49.8	47.2	48.0	49.6	59.2
1100	Air-cooled	400	40	46.1	49.8	47.7	48.5	49.8	60.4
1100	Air-cooled	400	60	45.8	50.6	47.2	48.4	49.3	59.6
1100	Air-cooled	500	10	45.3	49.8	46.1	46.9	48.5	60.0
1100	Air-cooled	500	20	45.1	50.2	47.0	47.4	49.2	59.6
1100	Air-cooled	500	40	44.8	50.2	46.2	47.4	49.0	60.4
1100	Air-cooled	500	60	45.0	49.6	46.5	46.2	48.2	61.0
1100	Air-cooled	600	10	45.3	49.5	46.6	47.5	48.1	58.6
1100	Air-cooled	600	20	44.2	50.0	46.0	47.0	48.3	56.8
1100	Air-cooled	600	40	46.0	50.2	47.1	48.5	47.8	58.7
1100	Air-cooled	600	60	45.0	49.0	46.2	47.7	48.0	58.4

is to be noticed here that the amount of decreasing hardness is greater the higher the tempering temperature. For the specimens oil-quenched from 1000 deg. the results show a similar tendency as described above.

The specimens oil-quenched from 1100 and 1150 deg. differ from each other with regard to hardness. The hardness of specimen No. 3 decreases by tempering for 10 min. at 100 to 400 deg. and it becomes constant thereafter, but at 500 deg. it decreases in 10 min., then increases until 40 min. and at 600 deg. it gradually decreases; an especially marked decrease is observed in 10 min. For the specimens oil-quenched from 1150 deg. the hardness decreases slightly for 20 min. by tempering at 100 to 400 deg. and no further change is observable; the hardness of specimens tempered at 500 deg. is constant for 40 min. and increases at 60 min.; by tempering at 600 deg. it is constant after increasing slightly at 10 min.

For specimen No. 4, oil-quenched from 1100 deg., no change in hardness is observable by tempering at 100 deg., but it decreases at 10 min. by tempering at 200 to 400 deg. and becomes constant thereafter; by tempering at 500 deg. it decreases at 20 min. and increases slightly thereafter; by tempering at 600 deg. it decreases slightly at 10 min. and becomes constant for further tempering and markedly decreases at 60 min. Concerning the hardness of the specimen oil-quenched from 1150 deg. again no change is observable by tempering at 100 deg.; at 200 to 400 deg. it increases slightly in 10 min.; by tempering at 500 deg. it increases slightly by 20 min. and markedly by 60 min.; by tempering at 600 deg. it increases by 10 min. and decreases slightly by 20 min. and becomes constant thereafter. For the hardness of specimen No. 5, oil-quenched from 1100 deg., no great change occurs as to the tempering time at 100 to 200 deg., but it decreases by tempering at 300 to 600 deg. for 10 min. and then becomes constant thereafter. In oil-quenching from 1150 deg. the hardness of the specimen increases by tempering until 20 min. at 100 to 400 deg., and at 500 deg. it increases gradually with the time and is a maximum in 60 min.; by tempering at 600 deg. it increases markedly at first and then gradually decreases.

The effect of tempering time on the hardness of specimen No. 6, oil-quenched from 900 deg., is to be considered next. By tempering at 100 to 200 deg. the hardness does not change with respect to the tempering time, but at 300 to 600 deg. it decreases in 10 min. and no further change is observable. The hardness of the specimen oil-quenched from 1000 deg. decreases in 10 min. by tempering at 100 to 200 deg. and becomes constant thereafter; at 300 to 400 deg. it practically does not change, but at 500 deg. it decreases in 10 min. and then slightly decreases. The hardness of the specimen oil-quenched from 1100 deg. does not greatly change by tempering at 100 to 400 deg., but at 500

TABLE 6

Heat Treatment				Rockwell Hardness (C-Scale)					
				Specimen No.					
Heating Temp., Deg. C.	Cooling Method	Tempering Temp., Deg. C.	Tempering Time (Min.)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
900	Oil-quenched	100	10	57.5	68.0	65.0	63.0	62.4	66.0
900	Oil-quenched	100	30	67.6	69.0	65.0	63.3	63.8	66.2
900	Oil-quenched	100	60	67.0	69.0	65.2	63.8	63.8	65.0
900	Oil-quenched	200	10	67.3	68.7	64.6	64.0	63.0	66.0
900	Oil-quenched	200	20	65.0	67.4	65.4	62.6	63.0	65.5
900	Oil-quenched	200	40	65.4	66.6	63.4	62.4	62.5	63.5
900	Oil-quenched	200	60	65.4	67.0	64.0	62.9	62.2	64.0
900	Oil-quenched	300	10	66.1	66.9	61.1	60.2	61.2	63.1
900	Oil-quenched	300	20	64.2	65.4	61.3	60.1	59.8	62.5
900	Oil-quenched	300	40	64.5	64.7	61.1	60.0	60.2	61.3
900	Oil-quenched	300	60	64.1	64.4	60.8	60.2	60.3	61.8
900	Oil-quenched	400	10	60.4	64.0	59.9	58.6	59.8	60.4
900	Oil-quenched	400	20	61.1	64.6	59.7	58.4	60.2	60.2
900	Oil-quenched	400	40	61.0	64.2	60.5	59.4	60.0	60.6
900	Oil-quenched	400	60	60.2	62.8	60.2	59.1	58.3	60.1
900	Oil-quenched	500	10	57.0	57.8	57.6	57.2	58.0	58.8
900	Oil-quenched	500	20	55.0	57.5	57.4	56.6	58.5	59.6
900	Oil-quenched	500	40	54.4	57.2	56.8	57.0	58.2	59.8
900	Oil-quenched	500	60	54.6	57.1	56.5	56.2	57.0	58.3
900	Oil-quenched	600	10	52.0	54.8	54.2	54.1	52.6	55.3
900	Oil-quenched	600	20	51.6	55.1	53.6	53.6	52.0	56.0
900	Oil-quenched	600	40	51.4	54.2	54.2	53.7	49.7	54.8
900	Oil-quenched	600	60	51.5	52.6	52.5	52.5	49.6	54.8
1000	Oil-quenched	100	10	59.8	65.2	69.0	68.6	67.5	48.8
1000	Oil-quenched	100	30	59.8	65.0	69.0	68.9	66.1	47.5
1000	Oil-quenched	100	60	62.0	65.5	68.5	68.3	66.1	48.6
1000	Oil-quenched	200	10	61.2	64.3	68.3	68.2	66.7	45.2
1000	Oil-quenched	200	20	61.8	64.0	67.6	67.0	66.8	45.0
1000	Oil-quenched	200	40	61.7	64.4	66.6	66.1	65.0	44.0
1000	Oil-quenched	200	60	61.1	64.0	67.0	66.4	64.4	45.2
1000	Oil-quenched	300	10	60.7	59.4	65.0	63.7	63.6	52.8
1000	Oil-quenched	300	20	61.9	59.2	65.1	63.5	64.1	52.8
1000	Oil-quenched	300	40	61.0	60.7	64.4	62.8	60.3	52.5
1000	Oil-quenched	300	60	61.8	60.9	63.4	62.3	62.4	52.4
1000	Oil-quenched	400	10	60.8	60.9	63.0	61.4	61.0	53.8
1000	Oil-quenched	400	20	62.2	61.4	62.6	61.0	62.3	51.1
1000	Oil-quenched	400	40	60.2	62.1	62.5	61.2	61.0	52.5
1000	Oil-quenched	400	60	60.6	61.4	62.8	61.1	61.0	52.4
1000	Oil-quenched	500	10	59.0	58.6	60.6	60.0	61.2	48.0
1000	Oil-quenched	500	20	57.0	57.6	60.9	60.4	61.4	51.6
1000	Oil-quenched	500	40	55.6	57.2	62.0	61.5	61.7	52.0
1000	Oil-quenched	500	60	56.6	57.2	62.1	61.2	61.8	53.2
1000	Oil-quenched	600	10	53.5	55.3	54.9	56.0	58.2	57.4
1000	Oil-quenched	600	20	54.4	54.2	55.4	56.0	58.0	59.0
1000	Oil-quenched	600	40	55.0	54.2	55.4	56.1	56.1	63.7
1000	Oil-quenched	600	60	52.4	52.6	55.1	56.0	55.9	62.0
1100	Oil-quenched	100	10	59.6	44.4	58.6	64.0	61.8	43.7
1100	Oil-quenched	100	30	60.0	46.7	58.5	64.5	60.8	43.3
1100	Oil-quenched	100	60	60.1	44.0	58.6	64.0	60.8	43.7
1100	Oil-quenched	200	10	59.0	44.7	59.6	57.6	62.0	44.4
1100	Oil-quenched	200	20	59.4	44.0	60.0	57.1	61.8	43.0
1100	Oil-quenched	200	40	58.6	44.4	59.1	56.7	61.0	43.4
1100	Oil-quenched	200	60	59.0	45.4	60.0	57.4	59.5	43.8
1100	Oil-quenched	300	10	59.5	44.0	56.3	58.1	60.3	43.1
1100	Oil-quenched	300	20	59.5	44.1	55.0	56.8	60.1	43.5
1100	Oil-quenched	300	40	61.5	44.6	56.3	55.8	59.0	43.5
1100	Oil-quenched	300	60	62.2	44.7	56.6	56.0	59.1	44.0
1100	Oil-quenched	400	10	61.6	42.4	55.7	55.6	58.3	43.5
1100	Oil-quenched	400	20	62.0	58.4	56.0	55.6	58.2	43.6
1100	Oil-quenched	400	40	61.2	59.3	56.2	54.3	58.6	44.3
1100	Oil-quenched	400	60	60.8	59.0	56.1	55.6	58.3	43.4
1100	Oil-quenched	500	10	58.1	57.6	56.5	56.3	57.6	43.2
1100	Oil-quenched	500	20	57.3	55.4	58.2	57.2	58.0	42.8
1100	Oil-quenched	500	40	57.4	57.0	59.0	58.0	58.3	40.2
1100	Oil-quenched	500	60	54.4	56.4	58.7	58.0	58.4	41.6
1100	Oil-quenched	600	10	53.6	57.0	58.2	62.6	57.1	46.3
1100	Oil-quenched	600	20	52.2	57.1	58.4	61.9	57.0	44.0
1100	Oil-quenched	600	40	52.3	56.2	57.6	63.6	55.5	52.2
1100	Oil-quenched	600	60	52.2	57.2	57.0	57.2	55.5	62.0
1150	Oil-quenched	100	10	...	...	49.4	47.7	49.4	...
1150	Oil-quenched	100	20	...	...	49.2	47.8	50.0	...
1150	Oil-quenched	100	40	...	...	49.0	47.6	49.8	...
1150	Oil-quenched	100	60	...	...	49.0	47.5	49.7	...
1150	Oil-quenched	200	10	...	...	49.5	47.7	49.0	...
1150	Oil-quenched	200	20	...	...	49.7	47.9	50.2	...
1150	Oil-quenched	200	40	...	...	50.4	48.0	49.9	...
1150	Oil-quenched	200	60	...	...	50.4	48.0	49.8	...
1150	Oil-quenched	300	10	...	...	51.0	48.5	49.6	...
1150	Oil-quenched	300	20	...	...	50.3	48.3	50.4	...
1150	Oil-quenched	300	40	...	...	50.6	48.1	49.2	...
1150	Oil-quenched	300	60	...	...	50.6	48.1	50.6	...
1150	Oil-quenched	400	10	...	...	49.2	48.4	50.1	...
1150	Oil-quenched	400	20	...	...	48.0	48.2	50.8	...
1150	Oil-quenched	400	40	...	...	48.0	48.0	51.0	...
1150	Oil-quenched	400	60	...	...	48.0	48.0	51.2	...
1150	Oil-quenched	500	10	...	...	51.0	47.7	52.3	...
1150	Oil-quenched	500	20	...	...	51.5	48.3	52.3	...
1150	Oil-quenched	500	40	...	...	52.1	48.5	54.0	...
1150	Oil-quenched	500	60	...	...	63.0	58.4	56.8	...
1150	Oil-quenched	600	10	...	...	52.4	53.0	53.1	...
1150	Oil-quenched	600	20	...	...	52.3	51.0	53.8	...
1150	Oil-quenched	600	40	...	...	52.5	51.4	53.0	...
1150	Oil-quenched	600	60	...	...	52.6	51.5	53.0	...

TABLE 7
Rockwell Hardness (C-Scale)

Heat Treatment	Specimen No.					
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Furnace-cooled from 900 deg.	40.3	41.5	39.3	38.3	38.0	48.3
Furnace-cooled and heated to 100 deg.	40.3	42.3	38.7	37.6	39.5	47.9
Furnace-cooled and heated to 200 deg.	40.0	42.4	38.2	38.2	39.9	47.9
Furnace-cooled and heated to 300 deg.	40.5	41.7	40.4	40.0	39.2	48.5
Furnace-cooled and heated to 400 deg.	40.6	42.1	39.3	38.6	38.2	48.5
Furnace-cooled and heated to 500 deg.	40.4	41.0	39.0	37.0	38.0	47.3
Furnace-cooled and heated to 600 deg.	39.4	40.5	39.1	37.4	38.2	47.3
Furnace-cooled and heated to 650 deg.	37.4	40.5	39.4	37.5	38.5	45.5
Furnace-cooled and heated to 700 deg.	35.7	38.9	38.6	36.7	38.4	44.2
Furnace-cooled and heated to 750 deg.	35.9	38.6	36.7	35.6	36.2	43.4
Furnace-cooled and heated to 800 deg.	35.4	39.5	36.4	35.4	37.0	44.2
Furnace-cooled and heated to 850 deg.	36.0	42.2	38.1	36.6	38.4	46.1
Furnace-cooled and heated to 900 deg.	37.4	42.6	40.4	37.6	41.0	48.0
Furnace-cooled and heated to 1000 deg.	40.5	43.0	41.6	40.2	42.1	49.1

deg. it decreases until 40 min. and increases slightly afterward; at 600 deg. it does not change greatly until 20 min. but markedly increases afterward.

The change in length of the specimens, oil-quenched from 1000 deg., due to the tempering was measured by means of a differential dilatometer. In specimen No. 1 an initial expansion shows the transformation of alpha-martensite into beta-martensite, and the contraction following with a rise of temperature is attributed to a tempering of the martensite and the expansion from 300 deg. results from the decomposition of residual austenite into martensite. In specimen No. 2 a successive expansion up to 400 deg. indicates a decomposition of residual austenite into martensite. Specimens Nos. 3 to 5 show an abnormal change at about 600 deg. due to the decomposition of residual austenite into martensite. In specimen No. 6 an abnormal change at about 500 deg. is due to the same reason described above, and a contraction above 500 deg. to a tempering of the martensite. These phenomena coincide well with the results of the hardness test. In specimens Nos. 3 to 5 the decomposition temperature of austenite into martensite was found to be higher than the results of the hardness test would indicate, but this was attributed to a more rapid heating rate.

In order to determine the softening temperature of die steels the specimens previously furnace-cooled from 900 deg. were annealed for 1 hr. at 650, 700, 750, 800, 850, 900 and 1000 deg. respectively, and the hardness values were measured after the specimens had been furnace-cooled. The results are shown in Table 7. The hardness of specimen No. 1 shows a minimum value at 700 to 800 deg., but markedly increases above 800 deg.; specimen No. 2 decreases until 750 deg. but increases above that temperature; specimens Nos. 3 and 4 decrease until 750 deg. and increase from 800 deg.; specimen No. 5 shows a minimum at 750 deg.; and specimen No. 6 shows a minimum at 750 to 800 deg. From these results it could be estimated that the softening temperature of the six die steels is in the neighborhood of 750 deg. C.

Die steels are usually heated to a certain extent by frictional energy produced not only in hot-working but in cold-working. Because of this the hardness at high temperatures was measured with oil-quenched specimens using a Honda-Sato impact hardness tester. The heating temperatures were changed from 100 to 600 deg. and tempering times from 5 to 70 min., and the impact hardness was measured for each temperature and time. In summarizing, the hardness of specimens oil-quenched from 900 deg. decreases gradually as the temperature rises, but for specimen No. 1 it increases slightly at 100 deg. This phenomenon is always present in this specimen when quenched from all temperatures owing to the change of alpha-martensite into beta-martensite, and the hardness of specimen No. 1 is always lower than that of the other specimens. For specimens Nos. 1, 3, 4 and 5, oil-quenched from 1000 and 1100 deg., the hardness gradually decreases with a rise in temperature; for specimen No. 2, oil-quenched from 1000 deg., it increases slightly at 100 deg.; for specimen No. 6, oil-quenched from 1000 deg., the hardness decreases until 200 deg. and then gradually increases owing to the decomposition of austenite into martensite. The hardness of specimen No. 2, oil-quenched from 1100 deg., decreases until 300 deg. and then suddenly increases showing a maximum value at 400 deg.; specimen No. 6 decreases until 400 deg. and then suddenly increases. These increases in hardness are due to a decomposition of residual austenite into martensite, and the initial decreases in hardness show a softening of the material due to the heating. These phenomena correlate well with the results of the hardness test at room temperature described previously. In specimens Nos. 3 to 5, high-chromium high-carbon steels, the hardness decreases with the heating but it is always comparatively high. The hardness of specimen No. 1 is always low though it increases at 100 deg.; specimens Nos. 2 and 6, oil-quenched from 1100 deg., show secondary hardening.

Experiments on the change in hardness due to the heating time show that the hardness of specimens Nos. 1, 3, 4 and 5 decrease greatly in the beginning of the heating, but the amount of decreasing becomes slight when heated more than 5 min.; further, the decreasing value is greater the higher the heating temperature. In specimens Nos. 2 and 6 the tendency of the change differs from the others, i.e., the hardness of specimen No. 2, oil-quenched from 1100 deg., increases at 400 deg. with an increase in heating time but at 500 and 600 deg. it increases rapidly for 10 min. and then gradually decreases. The hardness of specimen No. 6, oil-quenched from 1000 deg., increases gradually, and for the specimen oil-quenched from 1100 deg. it increases markedly at 600 deg. This latter increase in hardness is also attributed to the decomposition of residual austenite into martensite. These results coincide with those of the hardness test at room temperature previously described. The hardness

TABLE 8

Heat Treatment	Abrasion loss (mg)					
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Furnace-cooled from 1000 deg.	5.6	4.5	4.8	4.6	4.8	1.8
Air-cooled from 1000 deg.	2.9	2.4	3.2	2.9	2.8	1.2
Oil-quenched from 900 deg.	0.9	0.6	0.6	0.7	0.7	0.4
Oil-quenched from 1000 deg.	0.9	0.9	0.5	0.6	0.6	0.6
Oil-quenched from 1100 deg.	1.0	1.2	0.7	0.8	1.1	1.2
Oil-quenched from 900 deg. and tempered at 100 deg.	0.8	0.6	0.5	0.7	0.7	0.8
Oil-quenched from 900 deg. and tempered at 200 deg.	1.0	0.7	0.5	0.7	0.7	0.4
Oil-quenched from 900 deg. and tempered at 300 deg.	1.3	0.6	0.5	0.6	0.7	0.5
Oil-quenched from 900 deg. and tempered at 400 deg.	1.9	0.8	0.7	0.8	1.0	0.4
Oil-quenched from 900 deg. and tempered at 500 deg.	2.5	2.0	1.2	1.5	1.5	0.8
Oil-quenched from 900 deg. and tempered at 600 deg.	3.6	3.4	1.7	2.0	2.2	1.0
Oil-quenched from 1000 deg. and tempered at 100 deg.	0.8	0.8	0.5	0.6	0.7	0.7
Oil-quenched from 1000 deg. and tempered at 200 deg.	0.9	0.6	0.6	0.6	0.8	0.5
Oil-quenched from 1000 deg. and tempered at 300 deg.	1.0	0.5	0.7	0.7	0.7	0.3
Oil-quenched from 1000 deg. and tempered at 400 deg.	1.0	0.6	0.9	0.8	1.0	0.4
Oil-quenched from 1000 deg. and tempered at 500 deg.	2.2	1.3	1.1	1.3	1.5	0.7
Oil-quenched from 1000 deg. and tempered at 600 deg.	3.0	1.9	1.6	1.8	2.8	0.9
Oil-quenched from 1100 deg. and tempered at 100 deg.	1.0	1.2	0.7	0.8	1.1	1.2
Oil-quenched from 1100 deg. and tempered at 200 deg.	1.0	1.1	0.7	0.8	1.1	1.2
Oil-quenched from 1100 deg. and tempered at 300 deg.	1.1	1.1	0.7	0.8	1.1	1.2
Oil-quenched from 1100 deg. and tempered at 400 deg.	1.3	1.0	0.8	0.7	1.2	1.2
Oil-quenched from 1100 deg. and tempered at 500 deg.	1.5	1.6	1.2	1.4	1.5	0.8
Oil-quenched from 1100 deg. and tempered at 600 deg.	3.1	1.8	1.7	1.8	2.6	0.7

of the specimens does not change greatly during cooling from a temperature below 600 deg., and there is no great difference between the hardness measured directly at a high temperature below 600 deg. and that measured at room temperature after cooling.

Abrasion Studies Made

In die steels a high degree of resistance to abrasion is necessary, and since the resistance depends on the heat treatment various specimens were heat treated and abrasion tests made. These tests were made under the following conditions: friction force 80 gm., number of revolutions of the emery disk 42 per min., frictional horsepower 0.126 per hr., and frictional coefficient $\mu=0.26$. Table 8 shows the results.

In Table 8 it can be seen that in the case of furnace-cooling from 1000 deg. the abrasion loss of specimen No. 6 is the least and that of specimen No. 1 the greatest, while the others have practically the same value. In the case of air-cooling from 1000 deg. specimen No. 6 shows the least value, and the others are almost the same although considerably greater than that of specimen No. 6. In general, the abrasion loss of the air-cooled specimen is smaller than that of the furnace-cooled. In the case of oil-quenching the abrasion loss of specimens Nos. 3 to 5, quenched from 1000 deg., is the least; that of low-chromium high-carbon (No. 2) and of tungsten-chromium steel (No. 6) increases with a rise of quenching temperature. These results coincide with those of the hardness tests. In general, on any specimen the higher the hardness the smaller the abrasion loss.

An abrasion test was also carried out on specimens tempered at 100 to 600 deg. for 1 hr. and then air-cooled. These results are also shown in Table 8. The abrasion loss of the specimen quenched from 900 deg. does not change until 300 deg., excepting specimens Nos. 1 and 6, but it increases suddenly with higher tempering. High-carbon steel (No. 1) and low-chromium high-carbon steel show especially large values. The abrasion loss of the tungsten-chromium steel (No. 6) is the least among these specimens and does not change until 400 deg. after which it increases slightly at higher temperatures. The abrasion loss of high-carbon steel decreases at 100 deg. and then increases gradually with an additional rise of tempering temperature, the loss being the greatest for this type of specimen. By quenching from 1000 deg. the abrasion loss of the specimens, except No. 6, increases slightly until 400 deg. and then suddenly increases with temperature; No. 6 decreases slightly until 400 deg. and then gradually increases although its value is least among these specimens. In the specimen quenched from 1100 deg. the effect of tempering on the resistance to abrasion is almost the same as that of the specimens quenched from 1000 deg., but specimen No. 6 has a decrease in abrasion loss by tempering above 400 deg.

The above described results coincide with those of the hardness tests, and, in general, the specimens that have a higher hardness have a smaller abrasion loss. The abrasion loss of the air-cooled specimens is always smaller than that of the furnace-cooled, and the loss for oil-quenched specimens is still smaller; even the tempered specimens at 600 deg. show smaller values than that of the air-cooled. When the specimens are tempered above 400 deg. the abrasion loss is the least with specimen No. 6 and the greatest with specimen No. 1.

Die steels are sometimes given cold-working in operation. For example, a drawing die is often cold-worked to restore its hole profile. In order to investigate the effect of cold-working on the hardness specimens furnace-cooled from 900 deg. were cold-worked as severely as required to restore the hole profile in a drawing factory. The change of hardness was then measured. The results are shown in Table 9 in which it is seen that the hardness of all the specimens increases about 10 per cent by cold working. Since it was considered that the increase of hardness would assuredly have an influence on the resistance to abrasion, the cold-working was given to specimens by means of Matsumura's repeated impact tester and then the abrasion test was carried out. The hardness values

(Concluded on Page 88)

TABLE 9

Rockwell (C)	Specimen No. 1	2	3	4	5	6
Before cold-working	38.7	41.6	40.5	39.5	41.3	43.3
After cold-working	43.2	46.5	44.7	45.6	46.0	48.6
Increase of hardness, per cent	11.6	11.0	10.7	13.4	11.6	12.2

TABLE 10

Heat Treatment	Number of Blow	Specimen No. 1	2	3	4	5	6
		Abrasion Loss (mg)					
Furnace-cooled from 900 deg.	0	5.2	4.0	4.6	4.8	4.5	1.7
Furnace-cooled from 900 deg.	500	5.0	3.8	3.8	3.7	4.0	1.5
Furnace-cooled from 900 deg.	1000	4.8	3.7	3.6	3.6	3.8	1.4
Furnace-cooled from 900 deg.	2000	4.5	3.6	3.6	3.7	3.6	1.3
Furnace-cooled from 900 deg.	3000	4.5	3.5	3.6	3.7	3.6	1.2
		Vickers Hardness					
Furnace-cooled from 900 deg.	0	280	291	284	289	289	376
Furnace-cooled from 900 deg.	500	289	303	300	298	303	386
Furnace-cooled from 900 deg.	1000	291	301	306	303	306	399
Furnace-cooled from 900 deg.	2000	294	308	303	300	308	401
Furnace-cooled from 900 deg.	3000	294	308	300	298	306	407
		Abrasion Loss (mg)					
Air-cooled from 900 deg.....	0	3.2	2.6	3.0	2.8	3.2	1.0
Air-cooled from 900 deg.....	500	3.0	2.5	2.8	2.4	3.0	0.8
Air-cooled from 900 deg.....	1000	2.9	2.4	2.7	2.3	2.9	0.7
Air-cooled from 900 deg.....	2000	2.9	2.4	2.5	2.3	2.8	0.7
Air-cooled from 900 deg.....	3000	2.9	2.4	2.6	2.3	2.7	0.7
		Vickers Hardness					
Air-cooled from 900 deg.....	0	313	329	325	341	341	460
Air-cooled from 900 deg.....	500	321	341	337	347	343	457
Air-cooled from 900 deg.....	1000	323	345	341	347	353	470
Air-cooled from 900 deg.....	2000	321	347	341	347	351	473
Air-cooled from 900 deg.....	3000	323	347	343	347	356	473

TABLE 11

Air-Cooled from 1000 Deg.

Temperature Deg. C.	Absorbed Energy (kg-m) No. 1	2	3	4	5	6
Room temp.	0.068	0.076	0.096	0.105	0.096	0.191
100	0.176	0.139	0.286	0.241	0.241	0.116
200	0.211	0.191	0.385	0.306	0.286	0.126
300	0.251	0.201	0.472	0.412	0.422	0.136
400	0.286	0.464	0.564	0.522	0.502	0.231
500	0.380	0.490	0.604	0.582	0.542	0.380
600	0.492	0.584	0.654	0.694	0.594	0.564

Oil-Quenched from 1000 Deg.

Temperature Deg. C.	Absorbed Energy (kg-m) No. 1	2	3	4	5	6
Room temp.	0.068	0.076	0.096	0.105	0.096	0.191
100	0.096	0.096	0.096	0.124	0.096	0.191
200	0.135	0.096	0.106	0.124	0.133	0.211
300	0.154	0.106	0.125	0.162	0.153	0.230
400	0.172	0.136	0.145	0.181	0.172	0.249
500	0.210	0.151	0.164	0.210	0.191	0.190
600	0.229	0.176	0.190	0.229	0.210	0.191

Selecting Machine Set-Ups On

By R. W. GRAY
Time Study Department,
Westinghouse Electric & Mfg. Co.,
East Pittsburgh

PURCHASE of a ten dollar tool for the manufacture of one special part, a part that could have been otherwise manufactured at a total cost of less than ten dollars cannot be justified. Neither can an expenditure of ten hours labor in setting up the machine be justified when the quantity ordered could have been manufactured at a less total cost by another method. Methods of manufacture, procedure and the tools and equipment used should be at all times determined on a total manufacturing cost basis.

Correct methods of manufacture cannot be arbitrarily determined, nor is it always economical to manufacture a part according to the least each piece cost. Methods of manufacture can be determined only by calculation based upon accurate and equitable data for the establishment of allowed times, both for the machine set-up and the manufacture of each piece, and an established costing rate per hour for each method. A comparison, then, of the several possible methods will accurately determine the method of manufacture and the quantity of parts required to justify that method.

If it requires a blacksmith one man-hour to bend a given part on his anvil, or one man-hour is required to set up a bulldozer which would then bend the part in 0.10 decimal hour, it can be readily seen that, both costing rates being equal, one piece orders should be bent by the blacksmith and two or more pieces should be bent by use of the bulldozer. On the other hand, if a part can be manufactured on a hand machine, or a single-spindle automatic, four or more machines per operator, or a multiple-spindle automatic, three or more machines per operator, it is necessary that allowed times and costing rates applied should be accurate and comparable.

WHERE—

s_1 = Machine setup time in hours for method No. 1

s_2 = Machine setup time in hours for method No. 2

t_1 = Each piece time allowed in hours for method No. 1

Form 3744-L—W. E. & M. Co. Works Dept.—Printed in U.S.A. **STANDARD TIME** Routing No.

Dwg. Title Standard	Sec. I-31	Style Pattern	Dwg. No. 826990	Sub. 3	
Part Terminal Stud		Ins. Spec.	Item 30		
Mtl. 2678 Brass	Size 2-1/2" Diameter or Thick. 7/16	Die Mould	L. Spec.	Sub.	
Mach. Tool and No. Hand screw machine		Spec. Tool or Fixture	STANDARD TIME		
Operation		Oper. No. / Class of Labor / How Set	Set Up	Each Piece	
cut, turn & thread each piece	1	Gr.#26 B2 I31 #15	.75	.015	
countersink & drill 2nd end	2	Gr.#26 B2 I31 #15	.20	.004	

Recorded—Time Clerk Cost Clerk

FIG. 1.—First and second operations on a hand screw machine (at Left).

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Dwg. Title Standard	Sec. I-41	Style Pattern	Dwg. No. 826990	Sub. 3	
Part Terminal Stud		Ins. Spec.	Item 30		
Mtl. 2678 Brass	Size 2-1/2" Diameter or Thick. 7/16"	Die Mould	L. Spec.	Sub.	
Mach. Tool and No. Single-Spindle Aut. & Hand		Spec. Tool or Fixture	STANDARD TIME		
Operation		Oper. No. / Class of Labor / How Set	Set Up	Each Piece	
cut, turn & thread each piece	1	Gr.#41 A2 I41 #3	2.00	.0015	
countersink & drill 2nd end	2	Gr.#45 C1 I31 #15	.45	.0040	

Recorded—Time Clerk Cost Clerk Date Signed Time Study Dept.

FIG. 2.—First operation on a single - spindle automatic screw machine and the second operation on a hand screw machine (at Right).

Basis of Economic Quantities

FOR determining which of two or more machining methods will be most economical in producing a given quantity of a given piece, Mr. Gray here gives a formula employed in production planning at the Westinghouse East Pittsburgh works. He illustrates its use in connection with four different set-ups for machining a brass terminal stud.

t_2 = Each piece time allowed in hours for method No. 2

$r = \frac{\text{Costing rate per hour for method No. 1}}{\text{Costing rate per hour for method No. 2}}$

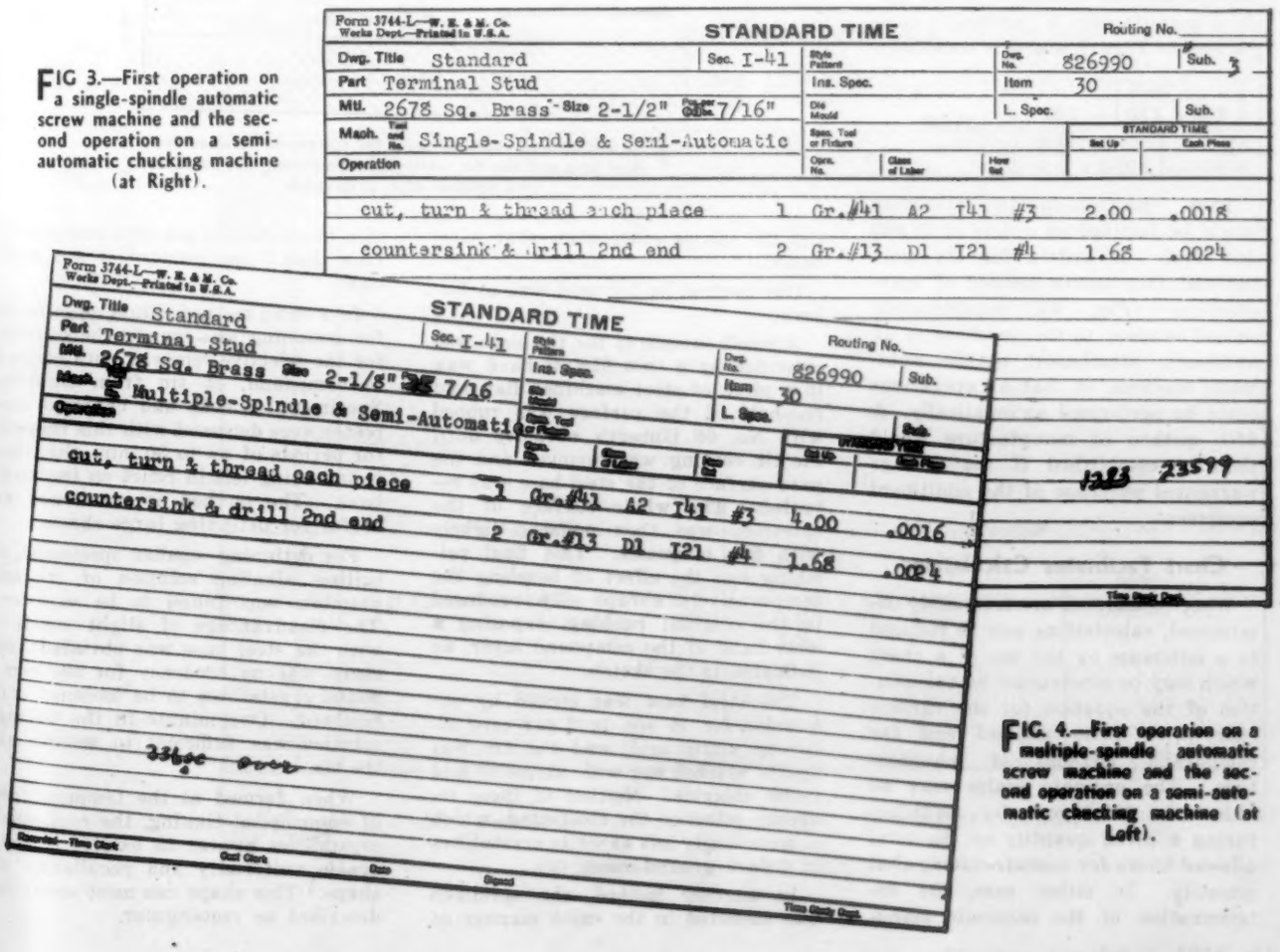
p = Maximum economic quantity for method No. 2 and Minimum economic quantity for method No. 1

THEN—

$$\frac{(s_1 \times r) - s_2}{t_2 - (t_1 \times r)} = p$$

Solution of this equation will determine the quantity of parts necessary to justify each machine set-up. It may be used to determine whether a single or multiple drill head should be used; whether a single milling machine or a battery of milling machines should be operated; or whether hand-operated machinery or automatically-operated machinery is to be employed.

Assume that an order for the manufacture of 2½-in. long, 7/16-in. square brass terminal studs is received. It is known that this part should be manufactured by one of four different methods, depending upon the quantity ordered. Both first and second operations can be performed on a hand screw machine as specified in Fig. 1; the first operation can be performed on a single-spindle automatic screw machine and the second operation on a hand screw machine as shown in Fig. 2; first operation can be performed on a single spindle automatic screw machine, and the second operation on a semi-automatic chucking machine as specified in Fig. 3; or the first operation may be performed on a multiple-spindle automatic screw machine and the second operation on a semi-automatic chucking machine, as in Fig. 4. Time values have been established and costing rates are known for each operation of the four methods, but what quantity will justify the difference in



Form 3744-L—W. E. & M. Co. Works Dept.—Printed in U.S.A.

STANDARD TIME

Routing No.

Dwg. Title Standard	Sec. I-41	Style Pattern	Dwg. No. 826990	Sub. 3	
Part Terminal Stud		Ins. Spec.	Item 30		
Mtl. 2678 Sq. Brass Size 2-1/2" Dia. or Sq. 7/16"		Die Mould	L. Spec.	Sub.	
Mach. Tool and No. Single-Spindle & Semi-Automatic		Spec. Tool or Fixture	STANDARD TIME		
Operation		Oprn. No. / Class of Labor / How Set	Set Up	Each Piece	
cut, turn & thread each piece	1	Gr.#41 A2	T41 #3	2.00	.0018
countersink & drill 2nd end	2	Gr.#13 D1	T21 #4	1.68	.0024

Recorded—Time Clerk / Cost Clerk / Date / Signed / Time Study Dept.

FIG 3.—First operation on a single-spindle automatic screw machine and the second operation on a semi-automatic chucking machine (at Right).

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STANDARD TIME

Routing No.

Dwg. Title Standard	Sec. I-41	Style Pattern	Dwg. No. 826990	Sub. 3	
Part Terminal Stud		Ins. Spec.	Item 30		
Mtl. 2678 Sq. Brass Size 2-1/8" Dia. or Sq. 7/16		Die Mould	L. Spec.	Sub.	
Mach. Tool and No. Multiple-Spindle & Semi-Automatic		Spec. Tool or Fixture	STANDARD TIME		
Operation		Oprn. No. / Class of Labor / How Set	Set Up	Each Piece	
cut, turn & thread each piece	1	Gr.#41 A2	T41 #3	4.00	.0016
countersink & drill 2nd end	2	Gr.#13 D1	T21 #4	1.68	.0024

1283 23599

Recorded—Time Clerk / Cost Clerk / Date / Signed / Time Study Dept.

FIG. 4.—First operation on a multiple-spindle automatic screw machine and the second operation on a semi-automatic chucking machine (at Left).

the set-up times of the various methods?

The first determination of quantities should be a comparison between method No. 1 (Fig. 1), and method No. 2 (Fig. 2). All times shown are in decimal hours.

$$\frac{\left[2.00 \times \frac{\$2.80}{2.57}\right] - 0.75}{0.015 - \left[0.0018 \times \frac{\$2.80}{2.57}\right]} = 81$$

Then orders up to 80 pieces should be manufactured complete on a hand screw machine.

It is necessary next to compare Fig. 2 with Fig. 3, to determine the maximum number that should be manufactured according to the method specified in Fig. 2. This is a comparison between the second operation performed on a hand screw machine and a semi-automatic chucking machine.

$$\frac{\left[1.68 \times \frac{\$2.23}{1.88}\right] - .45}{0.004 - \left[0.0024 \times \frac{\$2.23}{1.88}\right]} = 1283$$

Semi-automatic for the second operation then is justified on orders of 1283 parts and over.

For determining the point at which multiple-spindle automatic screw machine manufacture is justified, a comparison of Figs. 3 and 4 is necessary

$$\frac{\left[4.00 \times \frac{\$3.05}{2.80}\right] - 2.00}{0.0018 - \left[0.0016 \times \frac{\$3.05}{2.80}\right]} = 23{,}600$$

Thus, multiple-spindle operation would be justified on orders of 23,600 and over. If orders for the part justified this fourth method of manufacture (Fig. 4), consideration should be given to the purchase of an automatic attachment to the automatic machine, so that all operations could be performed automatically. A fifth method of manufacture would then be established if the savings warranted purchase of the additional equipment.

Chart Facilitates Calculations

Where quantities are frequently determined, calculations can be reduced to a minimum by the use of a chart which may be constructed by the solution of the equation for the various each piece times allowed and the comparable methods of manufacture. The ordinate scales may be either the total cost for manufacturing a given quantity or the total allowed hours for manufacturing that quantity. In either case, the determination of the economic manufacturing quantity is the intersection of the lines representing the two different methods. If a difference in the costing rates for the two methods of manufacture exists, the use of two scales on the chart is necessary.

Application of this method of calculating the justification of machine set-up times to any two or more methods of manufacture will definitely determine the least costly method. It may be found that quantities as low as 50 pieces will justify a machine set-up where an arbitrary quantity of 500 pieces is used. On other types of work, it may be found that 1000-piece orders are required to justify the same machine set-up. In either case, a direct saving will result from each order manufactured by the correct method. Total yearly savings realized from the application of this method will be dependent upon the total number of orders received in any department where two or more methods of manufacture are available.

Iron-Tin Alloy In Tin Plate

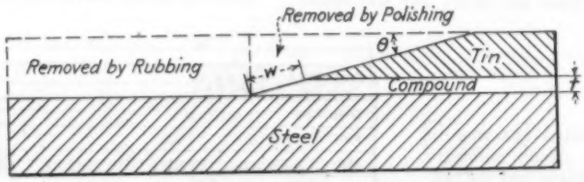
IN the process of tinplating, the iron-tin compound that is formed during the operation is $FeSn_2$, according to W. E. Hoare, Sir John Cass Technical Institute, London. Published work on the subject has been marked by an absence of clear micrographs of the compound, so Mr. Hoare undertook special investigations in behalf of the International Tin Research and Development Council. These he described before the (British) Iron and Steel Institute. No compound or iron-tin phase of any kind was observed by him in commercial tin plates other than that mentioned.

One method he followed was as follows:

A small sample of the tin plate was cemented by a thin film of hard wax to a piece of steel machined flat, and one-half of the surface was rubbed with No. 00 Hubert's abrasive until the tin coating was removed and the gray surface of the steel base was revealed. The whole surface of the specimen was then polished lightly with fine magnesia. This final polishing had the effect of beveling the comparatively abrupt step produced in the original rubbing, exposing a wide band of the compound layer, as indicated in the sketch.

The steel base was etched by immersion for 10 sec. in 2 per cent alcoholic nitric acid, and the tin was finally blacked out with alcoholic acid ferric chloride. Neither of these reagents attacked the compound, which is accordingly left as white crystallites in a dark ground-mass.

In another method, the specimen was mounted in the same manner as that described. The whole of the tin surface was then very lightly polished with a fine abrasive (preferably magnesia), etched with the ferric chloride reagent and examined microscopically. This cycle of operations was repeated until the desired structure was obtained. The method had the particular application of revealing compound which is for some reason isolated in the tin layer and not contiguous with the layer adjacent to the steel base. Before etching with acid ferric chloride it was found advisable to open up any flowed metal by a short immersion in alcoholic 2 per cent nitric acid. Less than 5 sec. immersion was sufficient.



FOR microscopic examination of the compound between the steel base and the tin coating, the tin plating was abraded to a beveled edge, so to speak.

In a third method dilute *aqua regia* for detinning was found to be suitable for the selective removal, with respect to compound, of tin from tinplate. Specimens of coke and charcoal tinplates were detinned with this reagent for periods of up to 30 min., the compound being left in relief on the steel base. The method is mentioned as useful for detinning large sheets.

For detinning smaller specimens, a boiling alkaline solution of sodium plumbite was found to be superior. The disadvantage of slight reaction with the steel base was obviated and there was no tendency for the compound crystallites to be loosened and removed. One minute in the boiling solution was sufficient to remove all the tin.

When formed at the temperatures of commercial tinning, the compound crystallites appear to exhibit considerable uniformity and peculiarity of shape. This shape can most easily be described as rectangular.

Graphical Balances Applied to Blast Furnace Operation

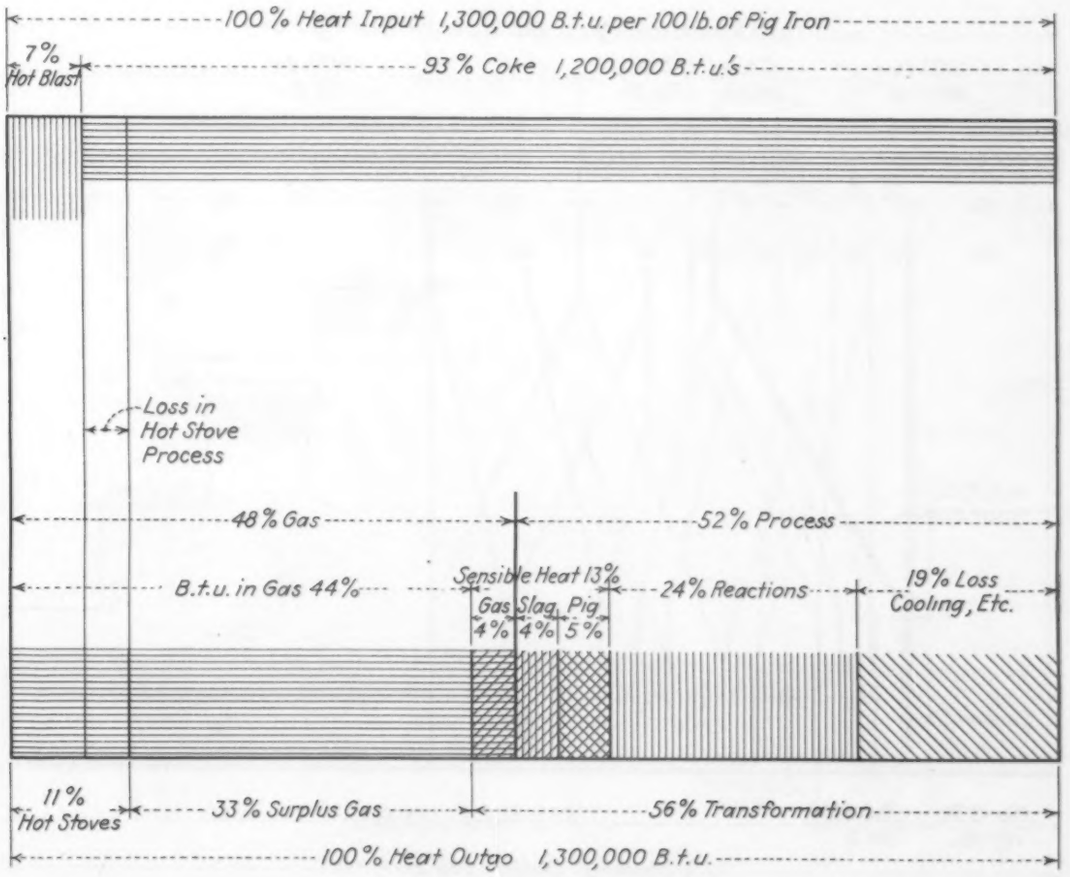
By JOSEPH F. SHADGEN

CLARITY and conciseness are the outstanding qualities of any summary and these must be apparent in any balance sheet, because the real purpose of balance sheets is a comparison of the two sides of the question. This applies to any specific problem of whatever nature and certainly to materials, or heat, or dollars, as they enter into metallurgical or mechanical processes.

The conventional method of showing a balance sheet is to write down neat rows of figures of which the totals come out even. This way of presenting results lacks proportions and visualization. Graphical balances have the great advantage of talking to the eyes through accurate pictures; not only is all the information presented but in addition relationship, coordination and ratios are featured in a simple, understandable manner.

To illustrate the practical advantages of graphical balances to both operating engineers and supervising management we have condensed the

FIG. 1



actual performance data of a Mid-Western blast furnace. A standard basic pig iron was produced out of superior ores, Michigan limestone of unusual purity and by-product coke.

A dispute of long standing had to be settled between the furnace operator and the power department of the plant. Many reports and analyses had been submitted but the interested parties failed to reach a conclusion because the written-out conclusions failed to present a picture in clear perspective of the issues at stake. The general management not familiar with the details and remote from the chemical aspect of the problem was confused until similar graphs were presented.

The three major issues in blast furnace operation are heat values, (B.t.u.), material quantities (tons or pounds) and cost prices (dollars).

Fig. 1 shows the heat balance in form of rectangle in which the heat input is shown to equal the heat outgo. The striking predominance of the heat content of the fuel (coke) hits the observer on the input end as well as the remarkable proportion of the blast-furnace gases of the total heat values involved. The sensible heat items are relatively small (some 13 per cent) and the reaction of the reduction process itself accounts for about 24 per cent or one-fourth of the heat supply.

The blast-furnace process is really efficient from the heat point of view inasmuch as the surplus gases are utilized. The consistent use of these originally termed by-product gases has been a major development for the past 30 years; first in boilers, then in gas engines, and now in furnaces. The increase in stove efficiency has also been taken into account and is reflected by the spread between 7 per cent and 11 per cent, or 7 per cent and 13 per cent, as the specific case may be.

Fig. 2 illustrates the graphical balance of the material flow through a blast furnace. Here again the rectangle furnishes the basis and expresses the old law of what goes in must come out, as the top and bottom lines are of equal length.

This picture makes the observer air-gas conscious. It shows the enormous proportions of the weights and volumes of gases handled. This fact catches the eye of even the untrained observer and reminds the trained one of some peculiarities that have become so familiar as to be overlooked or taken for granted. Over 50 per cent of the weight that goes into the blast furnace is wind and over 75 per cent of the output by weight is gas.

In addition, this picture shows the transformation of the various ingredients of the burden-coke charge. It is simple to follow the changes of oxygen into carbon monoxide and carbon dioxide and the split-off of the carbon in the pig iron and the gases.

This or similar graphs made on large scale (6 ft. or more, wall pictures, in fact) can be used to great advantage in burden calculation, daily comparison sheets and monthly operating data. They, of course, are most valuable in comparing performances between plants located in various sections of the country, such as Birmingham, Pittsburgh, Chicago and Colorado. The management of large corporations will be quick to realize the practical advantages of such a simple and accurate method of comparing results.

The most interesting reactions were obtained by applying these same graphical balances to the dollars and cents values of the blast furnace process. It is to be admitted from the outset that the rectangle as a basis was impossible because of the transformation. The raw material values had be increased. In

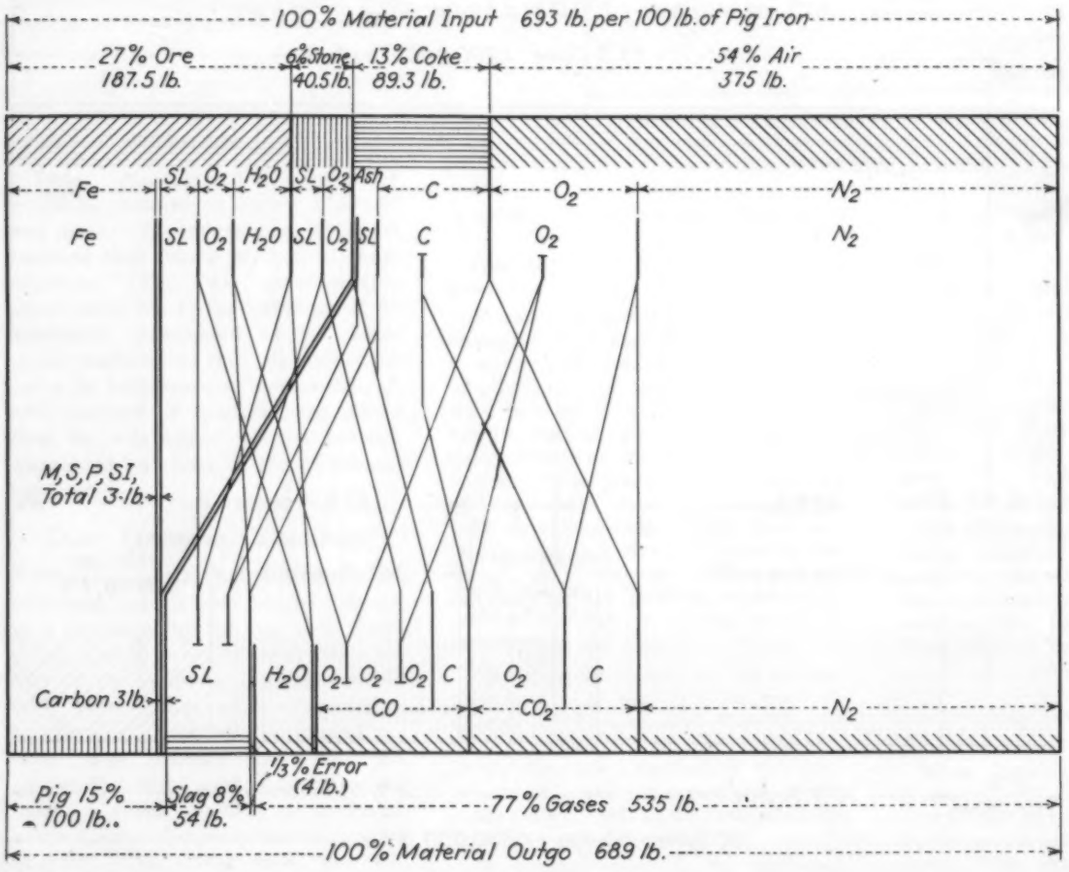


FIG. 2

other words, the product values must be greater or else there will be no profit. As profit is the fundamental justification of the whole process this had to be shown at a glance.

The money balance starts with the sum of the material values A A and progressively add the labor charge, B B, the maintenance cost, C C, the amortization, D D, and the profit, E E, to arrive at the products' values, F K.

Again the proportions are strikingly apparent. The air in spite of large quantity (pounds or volume) costs comparatively little. Coke and ore are the predominating dollar items of A A.

The labor item B B is somewhat constant; the large tonnages of each blast-furnace unit have compressed that item to a practically constant figure.

The item C C, maintenance, is elastic, largely determined by the policy of corporation, the load factor, etc.

The write-off charges D D are still more elusive as they are complicated with consideration of capital structure, etc., and profits depend on market economic trend, national influences, etc.

What Fig. 3 shows most clearly is the contribution values of the so-called by-products, slag, G H, and gases, H K. In other words, if the slag does not contribute a value, E F will be influenced very much; if G H or N N is nil, the profits will be sharply reduced.

The same applies to the blast-furnace gases. If their surplus is not used at all, the profit might disappear and even write-off charges might be affected. The management is hereby afforded a new tool with real practical advantage.

Blast Furnace Operation Succinctly Described

(Concluded from page 14)

dling. Sulphur and ash in coke detract from its value. If an operator is forced to use siliceous ores or to charge gravel to build up slag volume to handle sulphur, each additional per cent of sulphur will add from 14 to 20 cents to the cost of pig iron. Various estimates indicate that each per cent of additional coke ash will add about 13 cents to the cost of producing a ton of pig iron.

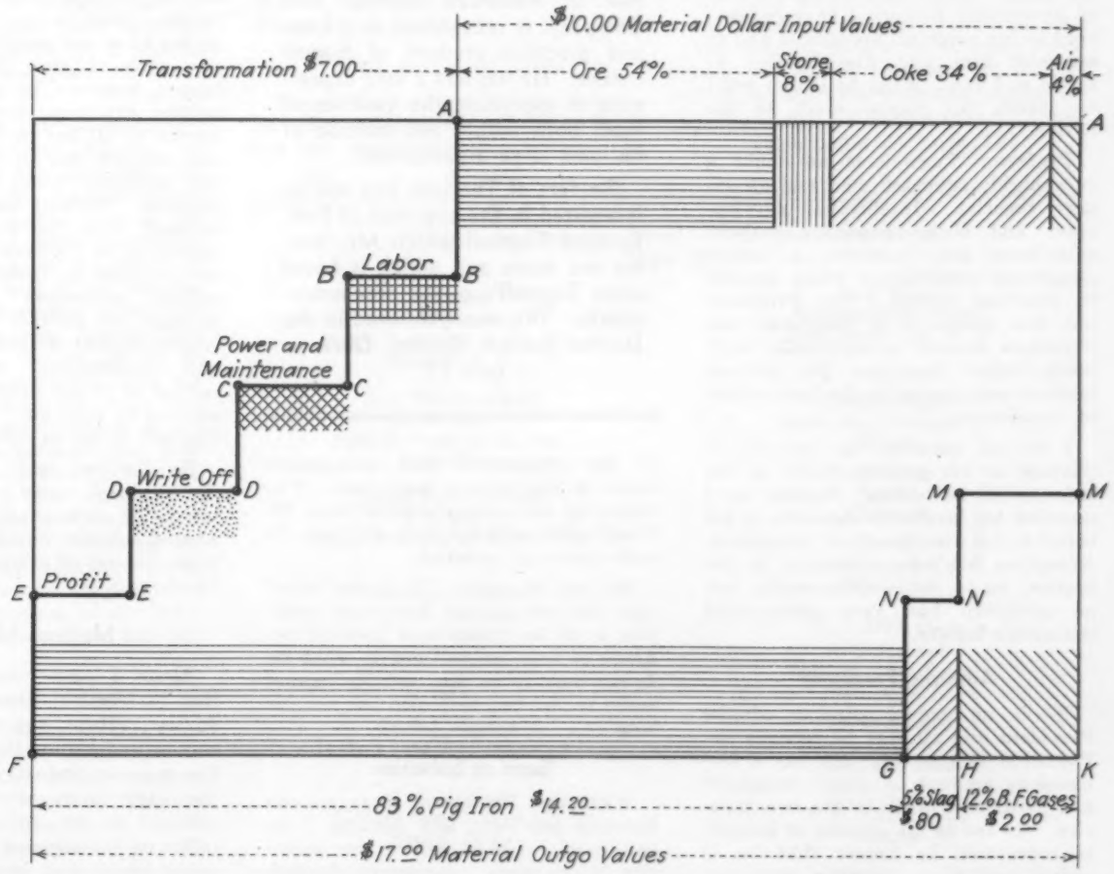
The economical limit of concentration of iron ore will depend upon the cost of removing the silica and upon the saving in smelting the concentrated ore. Due to variations in costs of raw materials and in the sulphur in the coke, the cost of each additional unit of silica per ton of ore will range from 10 to 14 cents and should be calculated for each set of conditions.

The value of fluxing limestone depends upon available calcium oxide above that required to flux the silica and alumina in the limestone, upon the size of the lumps, and upon uniformity in composition. Each additional per cent of silica plus alumina in fluxing limestone will decrease its value by about 10 cents per ton. Blast-furnace operators prefer larger sizes of limestone because the size preparation results in more uniform limestone of better grade.

A supply of coking coal is of first importance in a blast-furnace enterprise. The grade of all raw materials which may be used will depend upon transportation charges in assembling them at the furnace site.

This method of approach to any metallurgical or even sales problems has proved interesting and has also been amplified to surveys and critical studies on large-scale drawings. As the clarity of the presentation medium reflects the mind of the investigator, and no impressions are more lasting than the visual picture, graphical balance studies afford an easy method for most problems of operation, comparison, as well as appraisals and research.

FIG. 3



George M. Verity Appraises Prof. Tugwell Finds Lack of Appreciation Problems of Business

THERE are many who have had very little sympathy for or patience with Professor Tugwell, because of his utter lack of sympathy and understanding of the actual problems involved in the conduct of business and because of the many misleading and incorrect statements he has so inadvertently and openly made regarding industry. This is undoubtedly due to his lack of contact with or understanding of the problems and struggles that have been incident to its development.

Appraisal Made

After reading the full text of Professor Tugwell's address, delivered on April 21 before the American Society of Newspaper Editors, I have endeavored to lay aside all prejudices and to appraise him and his theories as fairly as I can. What he is and what he stands for means much to the nation.

Professor Tugwell is no doubt a very highly educated man and an expert theorist. Intellectual development and book knowledge without experience are, however, a rather dangerous combination when applied to practical things. The Professor has fine command of language and expresses himself exceptionally well, much better than can the average business man raised in the hard school of experience.

I do not question his honesty of purpose or his genuine belief in the reforms he advocates. Neither do I question his loyalty to America or his belief in his own brand of democracy. Accepting his own statement in the matter, he is not a Communist, but he certainly has very pronounced Socialistic beliefs.

Admires President

He is an ardent admirer of the President and all that he believes the President stands for. He has a tremendous amount of smug confidence and great assurance in his own theories. As far as his opinion of himself is concerned, he knows that he is right, and that, together with the character of his convictions, makes him very much of a crusader.

I regret to say that, in my humble opinion, he is simply wrong in much of his analysis and completely uninformed as to the policies and methods of our best business institutions, who are legion. He is wrong in his approach to our many national problems and entirely wrong in his methods of solution and in the remedies he proposes.

I say he is wrong in his understanding of our industrial problems because of the statements and admissions made in his various addresses. The following are some extracts from his Washington address that will help to make clear my point:

He said in part: "It is my belief that the core of the American tradition is to be found in a kind of defiance of fate, we will not do what we do not want to do, and coercion cannot make us, we can be fooled but not for long."

GEORGE M. VERITY, chairman of American Rolling Mill Company, is recognized as a keen and practical student of human nature. He has had a long experience in appraising the qualities of men, both within and outside of his own large organization.

Readers of The Iron Age will be interested in the appraisal of Prof. Rexford Tugwell which Mr. Verity has made and which is based upon Tugwell's public pronouncements. This was published in the Dayton Journal, Dayton, Ohio, on June 17.

Seen as Salvation

With that statement I agree one hundred per cent and because I do believe it, I feel it will be our salvation in the many experiences through which we are now moving and for some of which Professor Tugwell must be responsible.

The inference made is, however, that industry per se, does attempt coercion and does attempt to fool its best friends, its loyal workers and its host of owners, so if we are to give him credit for high purpose we must admit that he lacks knowledge and understanding of the facts.

There was a time 40 years or more ago when industry did coerce its employees. We can go back still further and find where most men were slaves and only a few were masters. There must be industries and other business institutions throughout the nation who do attempt coercion, to a greater or less extent, in one form or another, as we have not reached perfection in any walk of life. Such institutions cannot, however, be great in number, neither are they those who are well known to all the public. Coercion in this modern day of complex production problems would be both silly and suicidal. Modern industry must, to succeed, have the good will and cooperation of its employees. It could not perform its tasks and secure the needed perfection in quality of product or provide the service its clients require without such good will and cooperation, which must be earned as it can neither be bought or secured by coercion. I fear Professor Tugwell is not so informed.

He further said: "No one with the slightest sense of history would try to fit such a people into a regimented scheme, would try to think for them instead of getting them to think for themselves."

Modern Methods

Again I agree, as no one knows that fact better than does modern industry. Here again the Professor cannot understand the large part that the man in industry, the rank and file, very many of them, have contributed to its upbuilding. Modern industry is composed of many men of many minds and of many varied ex-

periences. Every man in a successful organization must contribute more than mere handwork; he must give of his interest, his loyalty, his initiative and his ability. Industry is a composite of its working forces from bottom to top, a coordinated synchronized football or baseball team, where every man has his place and does his part in a spirit of good will.

Professor Tugwell further says: "Indeed, anyone who has known them by living their lives, by really being one of them in body and spirit, would know in his heart, with no need for consideration, that law, government and social organization for such a people must be instruments through which their characteristic actions, resistances and imaginations could find approved expression."

Not having lived intimately with men in industry, Professor Tugwell does not seem to know that modern industry does provide just such expression as he refers to, and in a very large and marked degree.

Again he says: "When there are thousands of people working together in a business enterprise and those people are Americans, things will not run smoothly unless that enterprise bases its operations on free and full consent throughout the organization, rather than on economic coercion or arbitrary management."

Again I say that Professor Tugwell does not seem to know that modern complex industry could not operate successfully through coercion and arbitrary management. Such methods are relics of the past.

Professor Tugwell charges industry with coercion and arbitrary management while he and his brain trust associates are boldly advocating a bureaucratic control and a restricting of industry that would absolutely prevent effective expression or the exercise of any initiative on the part of either management or men.

(Continued on Page 42B)

Steel Warehouse Men Discuss Problems Of Codification—Business Improved

PROGRESS in the securing a code of fair competition for the industry, increased cost of operation under the NRA and recent improvements in volume of business and profits were the principal topics of discussion at the twenty-fifth annual meeting of the American Steel Warehouse Association, held at the Hotel Commodore, New York, on June 27. In addition the members heard reports from various standing committees devoted to cutting extras, distribution of sheet steel and the establishment of quantity extras on tool steel and cold-finished bars and shafting.

The meeting was characterized by a general dissatisfaction among the membership over the fact that the National Recovery Administration has not yet approved a code of fair competition for the steel warehouse industry. In discussing the situation, E. D. Graff, chairman of the association's industrial recovery committee, outlined the lengthy negotiations which have been carried on in an effort to have the proposed code approved and expressed the hope that results might be accomplished in the near future. He pointed out, however, that the members of the committee saw no reason for accepting a code which would not carry some benefits for the industry. Following the code hearing held during April, changes in the document as suggested by the legal department of the NRA were so extensive that little was left of the old code.

Losses Greatly Reduced

Of particular interest at this time was the report of the committee on cost of doing business which was presented by A. L. Philbrick, Congdon & Carpenter Co., Providence, R. I. He pointed out that returns from 42 companies indicated that for each $100 of sales in 1933, the net loss to warehouses had amounted to only 71c., as compared with a loss of $12.46 in 1932, $7.33 in 1931 and 74c. in 1930. At the same time, 1933 turnover was 2.30, as compared with 1.99 in the preceding year, 2.46 in 1931 and 3.07 in 1930. It was possibly significant that the 1933 loss was greatest in the first district comprising New England, New York and New Jersey, while warehouses in the Middle West and in the Pacific Coast States showed a profit.

NRA Increased Costs

Considerable interest was aroused by a discussion of the effects the NRA has had upon overhead expenses. The increases were variously estimated from 12 to 18 per cent, although price stabilization and various economies offered seem to have offset this to some extent. The results were probably best summed up by Guy P. Bible, Horace T. Potts Co., Philadelphia, who made the comparison between such increased costs and income tax payments. Mr. Bible called attention to the fact that income tax payments were generally resented until one's income reached such a point where taxes were no longer required. Then complaints were more vociferous than those made against payment of taxes. It is the same way, he said, with the NRA. The increase in overhead naturally came in for some criticism, but most warehouses would prefer it to former conditions when business had reached such a point when overhead was hardly necessary at all. At that point profits were also negligible.

Discussion of importations of for-

(Concluded on page 78)

Officers of American Steel Warehouse Association 1934-35

President
H. B. Ressler
Joseph T. Ryerson & Son, Inc.
Newark, N. J.

First Vice-President
Lester Brion
Peter A. Frasse & Co., Inc.
New York

Second Vice-President
J. F. Rogers
Beals, McCarthy & Rogers, Inc.
Buffalo

Secretary-Treasurer
B. R. Sackett
Philadelphia

Executive Committee

1935

Ralph J. Stayman
Jones & Laughlin Steel Corpn.
Pittsburgh

M. W. Faitoute
Faitoute Iron & Steel Co.
Newark, N. J.

H. B. Royer
National Bridge Works
Long Island City, N. Y.

1936

Charles Heggie
Scully Steel Products Co.
Chicago

E. L. Parker
Edgar T. Ward's Sons Co.
Pittsburgh

J. J. Hill
Hill-Chase & Co.
Philadelphia

1937

H. L. Edgcomb
Edgcomb Steel Corpn.
Newark, N. J.

Richmond Lewis
Charles C. Lewis Co.
Springfield, Mass.

A. C. Castle
A. M. Castle & Co.
Chicago

Open-Hearth Technicians Argue

WITH more than 100 superintendents and metallurgists actively participating in discussions pertinent to open-hearth operations, it is evident that some of the many problems which vex the industry will be clarified or new lines of attack formulated. Probably the largest single benefit derived from the open-hearth conferences is the abolition of a large amount of duplicate basic experimentation on steel development and plant rehabilitation. On this basis alone, even though the discussions are often reserved, the steel industry is each year saved many times the monetary expense of the meetings.

In this latest conference considerable attention was devoted to construction and operation problems, whereas the latter part of the meeting was of more interest to metallurgists. Apparently the Moll type checker is worthy of considerable attention as it is giving excellent service both in Germany and in certain installations in this country. It

THE old axiom that "one man's meat is another man's poison" was again given industrial significance at Pittsburgh in the June 28 meeting of the open-hearth division of the American Institute of Mining and Metallurgical Engineers. That is, the practices and methods of construction which one superintendent may find decidedly useful are often quite inefficient in another plant and under different conditions. This divergence of results often caused considerable confusion in the early years of the conference, but recently many variables have been more fully considered and standardized and results can, therefore, more accurately be correlated.

These meetings of open-hearth technicians are unique in that all members liberally give of their experience, and the free interchange of information has many times served its purpose by elevating the general knowledge of the industry, and reducing the amount of expensive experimentation which would otherwise be duplicated. Nowhere, perhaps, are valuable up-to-date experiences more generously described and intelligently discussed as in these meetings.

It was apparent when the conference opened that the intermittent operations of recent depression years are still reflected in a reduction of experimentation and less reliable campaign data on many phases of open-hearth operation. Nevertheless, many problems which last year seemed rather obtuse became clarified in the light of additional operating information.

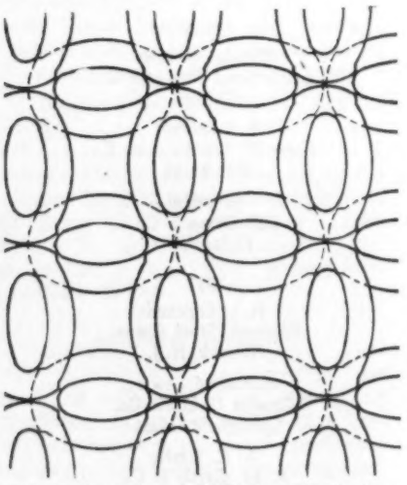


Fig. 1—A section of Moll checkerwork showing the method of laying-up the hollow refractories.

Chairman L. F. Reinartz welcomed more than 200 attendants, and then opened the two-day discussion by inviting talks on checker designs, refractories and general furnace insulation.

It was only natural that considerable time be devoted to refractories, for undoubtedly much of the present inefficiency of furnaces can be overcome only by the development of a reliable super-refractory and more knowledge concerning general installation technique. Furnace designers are badly in need of materials which will allow the use of higher flame temperatures with no reduction in life. Consideration was given to the comparatively new Kromag brick as well as the older Metalkase magnesite type, and the generally used silica and magnesite refractories.

The patented Kromag brick was placed on the general market over a year ago by E. J. Lavino & Co., and is a quite light, basic material which has a very high resistance to high-temperature deformation and spalling. Its thermal conductivity is somewhat higher than silica but less than magnesite, the density is about 0.11 lb. per cu. in., and there is practically no flow at 3000 deg. F. under a pressure of 25 lb. per sq. in.

Last year a report on an initial installation was very favorable for front and back wall construction. The general concensus this year was even more favorable. One operator reported much better results with Kromag than with ordinary chrome brick for certain parts of the furnace, whereas another installation used Kromag throughout with the exception of the back wall, for which magnesite was found to be preferable.

Metalkase brick, both squares and rounds, again came in for considerable discussion. This generally well-known material is a dead-burned magnesite, provided with a chemical bond, which is pressed into steel jackets. When exposed to high temperature the steel burns and melts at the surface and is absorbed into the refractory pores, thereby resulting in a monolithic surface. The steel several inches back is not affected materially, and thus provides a bond to the refractory which minimizes spalling. A variance often employed consists of magnesite brick layed-up with steel strips (14 or 16 gage) between the bricks.

Many operators are said to look with favor on Metalkase installations. One furnace, using the Harbison-Walker square type held up very well during a 700-heat campaign when used for bulkheads and end walls. Another furnace used Metalkase end walls insulated with slag and the performance has so far been satisfactory. Another furnace went 355 heats without replacement of side and end walls. The general opinion of the group continued to be favorable regarding insulated or plain Metalkase for certain sections of the furnace. This material may be replaced eventually by a simplified refractory, but at present it has a decided sphere of usefulness. In addition to these two types, several men spoke highly of their Rytex installations, and a number continued to prefer plain magnesite.

It is evident, therefore, that the subject of refractories is still in a state of flux. No brick, so far, at high temperatures (3500 deg. F. and over) satisfactorily resists the structural loads many furnace men would like to impose, and the thermal safety range for most materials is still too narrow to be comfortable. The iron oxide and

Production Problems . . .

was pointed out, however, that much more consideration should be given to the *insulation of downtakes and slag pockets* than to the development of additional checker schemes. That is, suitable thermal insulation, which also prevents air infiltration, will often raise the preheating temperature more than 300 deg. F. and thereby elevate the bath efficiency. On the subject of mold analysis it seems that current experiments on copper molds and stools should result in decided improvements in pouring action and the condition of steel in the near future. Also a low amount of residual copper in steel is apparently harmless. Many plants use "cheapeners" in their blast furnaces, and production results show that there is more to say for this practice than against it. For a close control of the quality of rimming steel it is necessary to make iron oxide analyses late in the heat, although an early estimate can be judged from the fluidity of the slag during melting.

lime fluxes from the bath are quite severe on even the best types of materials now marketed. Therefore, furnace men must still await further refractory development before they can replace silica brick for roofs and put in practice a number of other changes which have been suggested for more rapid and economic melting of steel.

Insulation Finds Favor

The general subject of both partial and complete furnace insulation again occupied a prominent place in the discussions. In considering this subject, some operators have previously concluded that wall and roof insulation would inevitably cause the furnace to operate with a higher inside temperature and consequently greater refractory wear would ensue. However, many superintendents have found that this condition did not follow.

The advantages to be derived from complete insulation could be stated as (1) gas-tight walls which almost eliminate infiltration of cold air and the escape of gases, (2) greater fuel efficiency, (3) more uniform and dependable temperature regulation, and (4) more efficient operation of checkers.

Several times during the discussion, operators claimed quite startling fuel savings which they attributed to insulation, although some saving was considered traceable to draft control. One good point was suggested; that is, *much of the gain attributed to the reduction of thermal losses really should be credited to the elimination of the infiltration of cold air.* Another point of paramount importance is the necessity of good flame control to prevent overheating of certain sections and consequent rapid deterioration of those sections.

Most of the reports dealt with the effectiveness of Therm-O-Flake, a comparatively new material marketed by the Illinois Clay Products Co. It consists of expoliated vermiculate with a special ceramic bond, and its durable qualities approach fire clay; a low K value of 1.45 at 1300 deg. F. is obtained, the density is 21 lb. per cu. ft., and it will withstand 30 lb. per sq. in. pressure at 2000 deg. F.

The data given concerning the value of insulation and the use of Therm-O-Flake were quite encouraging. In almost all cases the insulation resulted in *longer furnace life*, and fuel savings attributed to complete insulation ranged from 2 to over 5 gal. per net ton of ingots. Another furnace campaign ran 481 heats, and the Therm-O-Flake insulation was said to have prolonged the refractory life, although little fuel saving was secured. In this latter case the roof brick ranged from 18 in. to 13 in., and the insulation was about 5 in. About 3 in. of insulation was placed on the vertical walls, and 4 in. on the checker chamber roofs.

Another operator completely insulated his furnace for $1,225, and this cost was said to have been returned over three times during the first campaign. An 8.25 per cent fuel saving was secured, and the ingot yield increased 0.2 per cent. This furnace had draft control and over 48,600 tons of metal were poured before roof repairs became necessary. The Therm-O-Flake insulation was bound to the furnace by foundry nails set at 8-in. centers. The roof brick was 16.1 in. thick, and the insulation was 4 in. A thermocouple placed between the brick and insulation registered 1800 deg. at first but rose to 2100 deg. F. near the end of the campaign. This same operator now prefers some granular insulation with a Therm-O-Flake brick covering in order to increase salvage gains.

The insulating of furnace parts began as early as 1923 and insulated roofs were used as early as 1928. Now there are many completely insulated furnaces in this country. With the many types of materials now on the market, considerable interest was evinced in one man's report of satisfactory insulation with blast furnace slag.

Another furnace operator separated the Therm-O-Flake insulation from the roof by the use of metal lathes. Roof insulation was 2 in., about 1.5 in. was applied to other parts, and everything below the charging floor was insulated with blast furnace slag. The entire cost was $1,250, and over 150 heats were made before a general repair became necessary. A fuel saving of 1.7 gal. per ton resulted from the insulation.

The opinion of operators is decidedly in favor of complete insulation, and it was shown that such action actually more than pays for itself

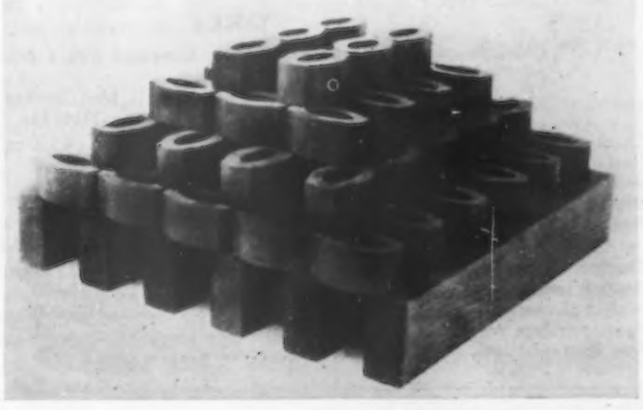


Fig. 2—Cut-out view of a Moll checkered chamber. The free area in the checker is 7 in. by 3⅛ in.; between checkers the area is 4 in. by 4 in. The wide bearing surfaces are shown quite plainly. These checkers are made from fire clay here although German mills occasionally use silica.

Fig. 3—Copper stool which is 60 x 39 x 8 in. in size and weighs 5747 lb. This type of stool is cast vertically in a water-cooled mold. Four cast-iron centering lugs can be bolted on if they are desired.

in the first campaign. Therm-O-Flake is judged to be quite satisfactory as a general insulating medium. Some cutting of end walls is often attributed to insulation, but a more careful flame and blast control usually eliminates this trouble. Other parts which burn out may have their life extended by changing the design of the furnace.

Moll Checker Described

The ordinary slag pocket is about 50 per cent efficient as a dust separating medium, and it is therefore of extreme importance that checkers be so designed to resist clogging as well as to transfer heat efficiently. The trade is constantly on the lookout for new types of checker brick and methods of construction, in order that the furnace efficiency can be improved and the campaign extended.

The Moll type checker was developed in Germany and has been employed there with considerable success on 125-ton furnaces. In recent years several American mills have used this type of brick. The design arose from the desire to embody the largest possible heating surface per cu. ft. of checker volume, combined with a sufficient free area per sq. ft. of horizontal checker area for the passage of dust-laden gases. It is evident from Table 1 that the heating surface per ton of checkerwork is greatly superior to the 4½ in. brick type checker. These data apply to a 150-ton furnace with an air chamber 31 ft. by 12½ ft., and a checker height of 10 ft. 10½ in., and a gas chamber 21 ft. long, 8 1/6 ft. wide, with a checker height of 10 ft. 10½ in.

Fig. 1 shows a cut-out view of a Moll checkered chamber illustrating the method of construction and the wide bearing surfaces which extend the life of the unit. In Fig. 2 a photograph of an actual section shows how the hollow units give a much larger surface area for the transfer of thermal energy.

There is no doubt that with the larger heating surfaces the gases will leave the chambers with a lower temperature, which in turn means a higher preheating of the air and gas and a higher and more uniform flame temperature. These checkers are of a simple shape, the wide bearing surfaces insure great stability, and the structural strength is equal to that of a 4 in. checker brick. It was found, after considerable experimenting, that the most efficient wall thickness is 2 in., and users say that about 80 per cent more of the theoretical heat capacity is available, as compared with a standard brick.

The discussions concerning the Moll scheme were varied, and it was the belief of several that the thin wall would result in clogging, crushing and spalling, and be more apt to sag at high temperatures. A rebuttal, by a German familiar with its operation, showed that theoretical thermal considerations favored the thin wall, and they should be made even thinner if the mechanical strength is not sacrificed. It was stated that many German installations have even smaller openings without serious clogging resulting. This is made possible through a good control of combustion and the use of large flues.

The quality of the brick itself is an important factor governing the internal flow of heat. Theoretically, therefore, the brick should have a high density, a high specific heat and a maximum thermal conductivity. From these considerations, both silica-carbide and magnesite brick should perform very well. A report on a magnesite installation validated expectations of good behavior, but considerable difficulty resulted from the marked tendency of dust to sinter on the brick and clog the checker.

One discussion stressed the unfairness of comparing the Moll checker with 4½ in. brick, as a thinner brick might show a more equal performance record. Another feature is that the salvage of Moll units is nil as they cannot be used for any other purpose. The standard type of brick can usually be cleaned and used in many parts of an industrial plant. This is a legitimate objection, as many Loftus installations have over 70 per cent salvage after campaigns of 300 to 400 heats.

However, the industry at present has to make as good an adjustment as possible, in view of the present dust-laden condition of discard gases. The Mol checker may be extremely useful for gas-fired furnaces but may clog up rapidly on furnaces using poor oils broken up with compressed air. Consequently an open-hearth superintendent should not judge the worth of different checker schemes and materials only on theoretical considerations and the results elsewhere, but he must attempt to select an optimum system in the light of local operating conditions.

The first section of the conference was concluded with a short discussion of the value and disadvantages of a stack fan. Such a mechanical draft naturally quickens the melting and simplifies the control of the flame. However many fans suffer severaly from oxidation, but one newly developed unit appears to have good characteristics, showing little deterioration with stack temperatures well above 2000 deg. F.

Many Prefer Tar on Molds

An interesting development of recent years is the steady growth of sloping back wall installations. In addition, one mill has for several

TABLE I

Characteristics of a Moll Type Checker Compared with a Brick Checker Air Chamber

	Moll Checker 11x4x2 in.	Standard Setting 13½x4½x4½ in.
Checker volume	4,130 cu. ft.	4,130 cu. ft.
Heating surface, sq. ft.	24,500	12,060
Weight of checkers in lb.	202,000	183,000
Heating surface per ton of checkerwork, sq. ft.	243	132
Free horizontal area, sq. ft.	164	170
Gas Chamber		
Checker volume	2,753 cu. ft.	2,753 cu. ft.
Heating surface, sq. ft.	15,400	8,039
Weight of checkers in lb.	127,000	120,000
Heating surface per ton of checkerwork, sq. ft.	243	134
Free horizontal area, sq. ft.	108	114

years combined a sloping front wall with a sloping back wall. The sloping sections merely extend the hearth of the furnace up nearer to the skewbacks and thus eliminate the lower front and back walls, both of which are rather weak zones. These sloping sections may be built up and patched with grain magnesite, dolomite or ground chromite. Naturally this method of construction imposes several unbalanced mechanical strains on the furnace framework.

In the discussions by men who have furnaces with sloping back walls, it was brought out that they worked back in nearly every case. In fact this displacement often amounted to 4½ in. The solution to this difficulty apparently depends on a much more rigid type of furnace framework. In fact, several furnaces have already been strengthened and the back walls held in shape thereby.

In considering the different causes of mold failure, it was pointed out that normal failure consists of fire cracking. The analysis of the mold has little to do with this difficulty, but it is preferable that the combined carbon be kept around 0.50 to 0.60 per cent. The fire cracking is a function of the growth of the ingot iron, consequently this growth should be kept at a minimum.

The above results apply to molds other than those rectangular in shape, as one user believed a rectangular mold should analyze about 40 per cent combined carbon for the best results. Several attempts have been made to add molybdenum to mold iron, and a 0.20 per cent addition does greatly reduce the cutting action. Molybdenum as high as 0.50 per cent, however, resulted in early failure due to cracking. Additions of chrome to mold iron are now being made but not enough pertinent data have been collected to justify an opinion on its usefulness.

In previous years operators apparently were more in favor of graphite than tar for mold coating. However, tar seemed to be preferred this year. One operator washed his molds and then dipped in tar. This washing kept both the mold and tar clean. Another used tar on the stools and smoked the molds. In both cases there was very little cutting-out at the bottom and cracked corners were kept at a minimum.

Of course, many plants do not use any type of coating but apparently get satisfactory results. One operator obtained good steel quality and an excellent surface by using U. S. No. 90 graphite. When this same operator changed to tar, he encountered some difficulty with blisters. Other furnaces use an aluminum wash with some success.

A goodly portion of the meeting was devoted to the value of copper molds, copper stools and copper inserts, and it was apparent that this subject will increase in imortance in meetings to come. In Germany, water-cooled copper molds have for some time been used for certain alloy steels. However, the practice is uncommon in this country.

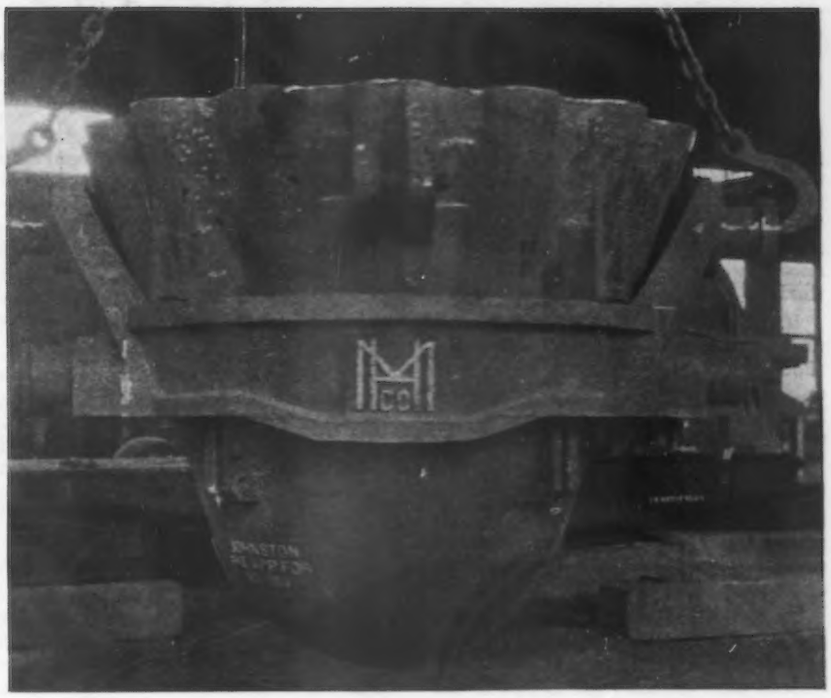


Fig. 4—A new type of cinder pot. The corrugations give 15 to 20 per cent more radiating surface than the conventional pot. The pot shown has a uniform wall thickness of 2½ in., and has a capacity of 250 cu. ft. The handling ring can support the pot on suitable brackets placed on the flat car shown in the background.

Most of the troubles experienced with cast iron comes from its low conductivity. As copper's conductivity is about nine times as large, some advantage should be gained, although the low melting point (1950 deg. F.) is a disadvantage, as sometimes welding and cutting-out occur. A number of experimental pourings in copper molds have been made in this country. By visual inspection the resulting ingots were very clean. The molds withstood normal handling, did not cut, but heat checks often developed and grew quite fast. The experimenters do not recommend an adoption of copper molds at the present time, but they hope to release a paper on this subject within the year. This paper will give the experimental results as well as the dangers to be avoided.

Evidently much benefit can be derived from the use of copper stools and inserts. Sometimes the metal as well as the force of the stream cause noticeable cutting, but this cutting seems to be some sort of function of the mass of copper present. A typical copper stool is shown in Fig. 3. This type is manufactured by the United States Refining Co., Carteret, N. J., and often 1500 heats can be run before the stool has to be discarded. The company buys back these used stools at a heavy copper scrap price and recasts them into new stools.

So far no determination has been made as to the optimum weight of copper for certain steels and pouring conditions, but the most important variable is the ratio of the area of the ingot bottom to the stool weight. A generalization could be made as follows: The ratio of the ingot to stool weight should be 1.6 or less; the ratio of the area of the ingot bottom to the thickness of the stool should be 2.1 or less; and for ingots up to 24 by 24 in., the copper stool thickness should be near 10 in.

Copper inserts have performed admirably in most every installation. However, if the inserts are of value, it would seem even more advisable to make the complete stool from copper. A "dished" insert with big-end-up molds is currently used in a number of shops making tool steel. The "dishing" reduces splashing and gives the butt of the mold a better shape. The structure of the steel itself, however, is not changed appreciably.

Rimming Control Depends on Iron Oxide Analyses

In every recent open-hearth meeting there have been a number of reviews of methods to control the quality of rimming steel. Outside of a relatively few there is often some confusion as to just what constitutes a rimming steel. This product could be defined as an open-hearth metal which is slightly or not at all deoxidized, which results in a large gas evolution during the solidification phase. In contrast to killed steel, the top of a rimming steel does not freeze over in the mold but solidifies uniformly and

concentrically from the outer surface to the center. Consequently the center steel, from top to bottom, is the last to freeze.

For a control of the quality of rimming steel, the lime charge, the composition of the iron, and the type of scrap used are the most important elements in the manufacturing process. These three controls and the type of slag produced must be counterbalanced by proper additions during the working of a heat.

If low iron oxide is desired in the finishing slag, the silica in the slag should be kept high. If high iron oxide is desired, the silica should be low, the lime high and proper additions of roll scale made if necessary.

The slag composition can be judged by the fluidity of the slag during melting and during the early working period, but, for a close control, iron oxide analyses should be made later on in the heat.

Concerning the control of grain size, aluminum was admittedly a good agent, but when it is used alone the bottom part of the steel is apt to be quite dirty, although the upper two-thirds of the ingot is generally very good. C. H. Herty, Jr., stated that the grain is totally dependent on the quantity of inclusions. In actual practice, an attempt is made to let the large inclusions float out and then distribute the small non-metallic inclusions. In killed steels ferrotitanium will restrain the spread of carbon to a minimum, produce a cleaner steel, and will keep the grain size from being very erratic. Titanium in combination with aluminum seems to have a beneficial effect on the grain size of high-carbon steel.

In most cases the object is to get the cleanest steel possible with a fine grain. However, this is usually quite difficult to attain. Dr. Herty recommended a silica-manganese addition in the furnace, and an all aluminum or aluminum and some other strong deoxidizing agent in the ladle.

After considering grain size, the trend of discussion was toward the effect of residual copper on the properties of steels. The opinion was that for annealed sheets a copper content up to 0.10 per cent causes no trouble, although percentages from 0.10 to 0.20 per cent have a tendency to raise the yield point, raise the Rockwell "B" hardness and lower the elongation. What is commonly termed "hot-shortness" is not caused by copper.

A fairly high copper content will cause a characteristic roughness on the surfaces of bars and billets. This roughening can be completely avoided by adding nickel equal to 33 per cent of the copper. For instance, steel containing 1 per cent *Cu* should have 0.33 per cent *Ni*. There are now such steels on the market which have good surfaces. Generally when the copper content increases there is a like increase in tin. The bad effects on the ductility which are usually attributed to *Cu* more often are caused by the tin. Many commercial steels on the market contain 0.05 to 0.20 per cent *Cu* without any deficiency in their deep drawing qualities.

In a general discussion regarding pouring technique, the practice of double pouring came in for considerable criticism. Double pouring does not lengthen the life of ladles as the life is mostly regulated by the quality of the slag. Neither is much time gained in actual practice by the double pouring scheme.

Another short discussion dwelt on the control manifold system of distributing exygen throughout a plant. These systems have welded joints and usually have control valves in each department. Five to ten cylinders are attached to the manifold or a centrol pumping station distributes the oxygen over the plant at a pressure about 125 lb. per sq. in.

Another interesting development was not discussed in the meeting but it did atract considerable attention afterward. It dealt with a new type of slag pot which has a corrugated surface. This pot is shown in Fig. 4. The peculiar design of the pot is said to result in a 300 per cent increase in life as compared with the conventional type. In plants where it has been used for some time the pot has often become half filled with molten steel, after which it was sent to the cinder recovery yard and returned without any cracks, bulges or deformations appearing. This pot is made by the Mackintosh-Hemphill Co., Pittsburgh, under patents held by William Johnston, Jr.

Advises Use of Cheapeners

A report on the use of cheapeners in the blast furnace stated that a plant saving of $2 a ton can be secured without any serious influence on the steel. It was assumed that most of the scrap which is charged consists of borings or turnings which usually contain particles of alloy and carbon steels, bearing metals, and machine shop turnings, which often contain considerable amounts of copper and tin. These contaminations are carried to the open-hearth.

Tin does have some effect on the rolling qualities of steel. However, it is very doubtful if the selected scrap used in the blast furnace (provided the furnace does not get too cold, has any harmful effect on the quality.

Open-hearth slag has some beneficent use in that it raises the manganese content of the iron, which in turn gives a better quality of steel. However, there are some disadvantages as it raises the phosphorus in the iron, and this has to be taken care of in the open-hearth. In making high-carbon steel, and using silico-manganese through the bath, if the iron oxide in the slag is too low there is apt to be some kick-back of phosphorus into the steel. In general, however, there is more to recommend the use of slag than reasons against the use.

Copper has some hardening effect up to a certain point. This effect influences the ductility of the steel. It seems that if the copper content in hot metal is 0.030 per cent or less, then the other contaminations associated with copper, and which are usually charged in the same scrap, such as chrome and nickel, would likewise be so small that no harmful results would ensue.

Before the meeting closed there were several comments made on the value of automatic reversal of open-hearth furnaces. Such a procedure has almost everything in its favor. By its use a higher average preheating is secured and fuel savings often amount to 5 per cent. Often one side may run hot, but this condition is always less pronounced than in furnaces manually operated. The efficiency of a furnace is almost always raised by automatic control, and there is less tendency for the end walls and other parts to wear away. A chromel-alumel couple in the center pass of the checker is a common method of control, and this type of installation will usually last three months before replacement is necessary.

Chicago Chapter of Metals Group Elects

THE Chicago chapter of the American Society for Metals at its annual meeting elected the following officers for the year 1934-35: chairman, H. A. Anderson, Western Electric Co.; vice-chairman, H. B. Knowlton, International Harvester Co., and secretary-treasurer, K. H. Hobbie, Driver-Harris Co.

The executive committee was elected as follows:

R. F. Anderson, Anderson-Shumaker Co.; R. A. Bull, consultant; J. F. Calef, Automatic Electric Co.; Otto F. Carl, Cyclops Steel Co.; L. A. Daines, Heppenstall Co.; Elmer Gammeter, Edison G. E. Appliance Co.; M. A. Grossmann, Illinois Steel Co.; J. E. Robinson, International Harvester Co.; C. L. Saunders, Brown Instrument Co.; A. J. Scheid, Jr., Columbia Tool Steel Co., and Jestyn Williams, Mills Novelty Co.

Progress Shown in Standardizing Specifications For Metallic Materials

TECHNICIANS representing the producers and consumers of engineering materials had their usual June gatherings last week at Atlantic City, N. J. The occasion was the regular annual meeting of the American Society for Testing Materials, featured, as hitherto, by numerous committee meetings throughout the week and by general sessions for the presentation of the committee reports and the reading of technical papers bearing on materials and testing. The total registration was roughly 825, or about one-fourth more than in 1933 and one-fifth more than in 1932.

In the field of ferrous metals the committees concerned with standards for the chromium and chromium-nickel steels and irons and those devoted to the corrosion and heat-resisting steels for high-pressure work were particularly active. The committee on wrought iron presented a definition in detail, that is, a quality standard, for wrought iron. Among the papers, or individual contributions, was one detailing failures of alloy tubes in oil stills and two relating to the interpretations of creep tests.

It may be added that there was evidence that the committees concerned with the Society's field corrosion tests are beginning to be able to draw conclusions in respect to those long-time exposures. Finally, the checks to laboratory investigations and research work caused by the industrial depression were not generally of the magnitude to be expected, seeing that most of the committees were able to indicate varying degrees of progress.

New Officers

The address of the retiring president, Prof. T. R. Lawson, Rensselaer Polytechnic Institute, Troy, N. Y., introduction of the officers elected for the ensuing year and bestowal of the Charles B. Dudley medal were made features of the social session of the meeting Wednesday evening. The new president, W. H. Bassett, metallurgical manager, American Brass Co., Waterbury, Conn., who has served as vice-president the past two years, is recovering from illness and could not be present but a message from him was read by Past-President G. H. Clamer. The new vice-president, to serve for two years, is H. S. Vassar, Public Service Electric & Gas Co., Irvington, N. J. The additions to the executive committee are: H. A. Anderson, metallurgical engineer, Western Electric Co., Chicago; H. J. Ball, professor of textile engineering, Lowell Textile Institute, Lowell, Mass.; W. M. Barr, assistant to executive vice-president, Union Pacific Railroad, Omaha; L. S. Marsh, manager, department of inspection and metallurgy, Inland Steel Co., Chicago, and J. B. Rather, in charge general laboratories, Socony-Vacuum Corpn., New York.

The Dudley medal, awarded for his 1933 paper on "The Fatigue Properties of Light Metals and Alloys," was presented to R. L. Templin, chief engineer of tests, Aluminum Co. of America, New Kensington, Pa.

Society Kept Within Its Income

The society itself has continued to weather the depression storm, as shown by the formal report of the executive committee, presented by President T. R. Lawson and Secretary-Treasurer C. L. Warwick. For the third successive year it faced a reduced income but met expenses without drawing upon reserves. It published 5919 pages of material in 1933, compared with 6130 in 1930. While its net loss in membership for the year was 164, comparing with 430 for the preceding year, the number of new members elected was 254 as against 170 reported a year ago.

The next general meeting of the society will be held at Detroit, late in June, 1935. One of the factors leading to the selection of that city was the decision to hold another exhibit—the society's third—of testing equipment. A regional meeting, as a nucleus for the next general gathering of committees, will be held in March in Philadelphia. The special topic of discussion will be paint in all its applications.

Continuing Activities Outlined

Some of the continuing activities were brought out in the reports of the general committee on research, Prof. H. F. Moore, University of Illinois, chairman, of the general committee on methods of testing, W. H. Fulweiler, United Gas Improvement Co., Philadelphia, chairman, and of the general committee on standards, Cloyd M. Chapman, consulting engineer, New York, chairman. Mr. Chapman pointed out that for consideration of the current meeting, action was to be taken relating to some 174 standards and tentative standards and that there were already established by the society 466 standards and 224 tentative standards, or 690 all told, and thus by the end of the meeting this total would likely rise to 718.

The detailing by the several subcommittee chairmen of the general committee on methods of testing was impressive in respect to the work in progress on the factor of speed in testing, on bend tests for ductility, on tests for sheet metal, on harmonizing Brinell hardness standards, on impact tests, particularly in a listing of the fields where such tests may be of service, on clarifying the matter of elastic strength, on simplifying the calibration of testing machines, on establishing a common denominator, so to speak, of measures of consistency or plasticity of all materials, and so on.

In the category of nomenclature and definitions, the society's committee on magnetic properties presented a comprehensive revision of the definitions of terms, with units and symbols, relating to magnetic testing, committee A-2 on wrought iron submitted a report setting for what wrought iron is, and announcement was made of the completion of definitions for the gross and net calorific values of liquid and solid fuels, one for gaseous fuel being held in abeyance.

In the field of ferroalloys, committee A-9, James B. Gill, chief metallurgist, Vanadium Alloy Steel Co., Latrobe, Pa., chairman, and Charles McKnight, International Nickel Co., Inc., New York, secretary, presented a tentative specification for the sampling of molybdenum salts and compounds and voted to pass on to standard tentative specifications for the following: Ferromolybdenum, ferrotungsten, low-carbon ferromolybdenum and molybdenum salts and compounds. Methods for chemical analysis of ferrotungsten and ferro-

molybdenum were added to the existing standard for analyzing ferroalloys.

Changes in Steel Specifications

Committee A-1 on steel made recommendations for changes affecting 29 standards. The specifications for open-hearth carbon-steel rails were revised "to make them more acceptable to domestic railroads and to foreign buyers," and it is likely that a compilation of specifications for rails and fastenings will be published in pamphlet form. The rail changes include a minimum of 0.10 per cent silicon for all weights of rail instead of a minimum hitherto of 0.15 per cent and make the carbon range 0.64 to 0.77 per cent instead of 0.62 to 0.77 for the 85 to 100-lb. rails, 0.67 to 0.80 instead of 0.67 to 0.83 in the 100 to 120-lb. rails and 0.69 to 0.82 instead of 0.72 to 0.89 in the 121 to 140-lb. rails. The manganese allowance for the 100 to 140-lb. rails will hereafter be 0.70 to 1.00 instead of 0.50 to 0.90 per cent.

In ship steel, tension tests will no longer be required on thin material, such as plates 3/16 in. and under, or shapes less than 1 sq. in. in cross-section and bars less than ½ in. in diameter. Allowable sulphur content of rivets was increased from 0.045 to 0.05 per cent.

A further tolerance provision was made in the concrete reinforcement bar specifications; this is for the individual bar. "The weight of any individual bar shall not vary more than 6 per cent under the theoretical weight for bars ⅜ in. and over in diameter; nor more than 10 per cent under the theoretical weight for bars under ⅜ in. in diameter."

Car and tender axle specifications were tentatively revised to include an extension of the manganese range from 0.40 to 0.70 per cent to 0.40 to 0.90 per cent and a modification of the number of tests required on small orders. In the case of wheels for electric railway service, manganese and silicon ranges have been raised and tolerances set up for wheels used on grooved rails and a greater tolerance for wheels used on T-rails.

Pipe Standards

In the field of pipe and tubing, a tentative specification has been drawn up for electric-fusion-welded steel pipe for high-temperature and high-pressure service, this being the one new specification offered this year by Committee A-1. For zinc-coated pipe for ordinary uses, a revised specification has been written to incorporate galvanizing requirements and a rate provided in the standard for welded and seamless pipe so that a galvanized product could be purchased under the specification. A revision was also made in the hydrostatic test for forge welded pipe, the duration of the test to be 30 sec. instead of 5 sec.

Progress was reported in the formulation of a specification for filler metal for use in fusion welding and publication of the proposed tentative standard was suggested in the course of the next few months for the information of the society's members.

A new table of maximum service pressures for power piping at temperatures below and above 750 deg. F. was offered by subcommittee XXII on steel for high-temperature piping work. In the case of alloy steel bolting material the committee has ruled that nuts cut from drawn or rolled bar stock shall not be permitted; instead they must be made by the cold-punched or hot-forged, cold-trimmed process. In the case of grade A seamless pipe material, the elongation requirement is now 35 per cent in 2 in. instead of 30 per cent. The committee reported notable progress in preparing specifications for materials to be used at temperatures of 750 to 1100 deg. F. and on carbon steel nuts for steam service temperatures up to 850 deg. F.

H. H. Morgan, as chairman of a sectional committee on standardization of dimensions and material of wrought pipe—an American Standards Association project with which the American Society of Mechanical Engineers is identified — reported progress of what he termed a very constructive movement, emphasizing that pipe will be known by schedule numbers rather than as extra strong, double extra strong, etc., but without disturbance as to current practices or usage.

Effect of Sulphur in Steel

H. S. Rawdon, National Bureau of Standards, as acting chairman of the long existing joint committee on investigation of the effect of phosphorus and sulphur in steel, presented two reports. One had to do with the effect of added phosphorus, which was mentioned in THE IRON AGE of June 28, page 31. The other discussed tests of some eight heats of steel made by the Jones & Laughlin Steel Corpn. of a nominal carbon content of 0.45 to 0.50 per cent and sulphur varying from 0.03 to 0.10 per cent. The steel was rolled and forged into 1, 2 and 8-in. rounds and tests made in the annealed and in the quenched and tempered condition. Chemical analyses showed a downward trend in the carbon content as the sulphur increased. The results of physical tests appeared to show no appreciable effect of the sulphur or at most an effect so little that it was regarded as masked by other factors. Some disappointment was expressed that the investigation did not cover red shortness to be observed in hot working and the report when printed is to explain that fact.

Extensive revision has been made to the society's standard for cold-rolled strip steel, so there is now a new tentative specification set up for suggestions and criticism. There has been a revision of the gage tolerances to bring them in line with NRA code tolerances, an introduction of a description of the demarcation between cold-rolled sheets and cold-rolled strip steel, removal of the table of physical properties from the body of the specification and appending it to the specification in amplified form, together with observations on age hardening and stretcher strains.

Officers of Steel Committee

The officers of A-1 were reelected, for the two-year term which obtains, as follows: Chairman, H. H. Morgan, Robert W. Hunt Co., Chicago; secretary, H. P. Bigler, Rail Steel Bar Association, Chicago; vice-chairmen, E. F. Kenney, Bethlehem Steel Co., and H. W. Faus, New York Central Lines. New chairmen for subcommittees were announced: Rear-Admiral Watt, to head the committee on structural steel for ships; T. G. Stitt, Seamless Tube Division, Pittsburgh Steel Co., the committee on steel tubing and pipe, and N. L. Mochel, Westinghouse Electric & Mfg. Co., the committee on steel for welding. Dr. F. N. Speller, National Tube Co., will represent iron and steel interests on the International Standards Association.

Joint Research on High Temperature Properties

The research committee on the effect of temperature on the properties of metals (the joint body of the American Society of Mechanical Engineers and the American Society for Testing Materials) voted to draw up a definite plan for the study of methods of evaluating the load-carrying ability of metals under prolonged stress at high temperatures. The creep of selected materials will be studied by test runs to be carried out, not merely for 1000 or 2000 hr., but for three years, or, say, 25,000 hr., in order that the validity of various methods of approximation and extrapolation and the relation of various short-cut methods to actual long-time performance may be ascertained.

It is planned also to study the progressive changes in toughness, during long exposure to high temperatures, of the 18-8 stainless steel. Continuation of the work done on this steel is aimed to throw light upon the fact that this material, though free from added "stabilizing" elements, was not embrittled by long sojourn under load at high temperatures in the creep tests. The question whether this austenitic steel passed through a brittle stage, without evidence in the creep curves of any change in load-carrying ability, and then recovered from its brittle state, or whether it never did become embrittled, is of

both theoretical and industrial importance.

The committee is to undertake the correlation of data on properties of metals at sub-zero temperatures, and also the correlation of data on seizure (effect of temperature on metal to metal wear). The need for something more than information of an empirical nature is in mind in the case of the latter activity, as for users and makers of valves that operate at elevated temperatures.

Major R. A. Bull was named as chairman of a subcommittee to procure funds for carrying out the experimental program outlined. The more specialized projects with programs of special commercial interest to a particular branch of industry are to be financed apart from the fundamental program. An example of such specialized interest is that of the oil industry and its suppliers, in still tube materials; for this there is a special finance committee headed by H. J. Kerr, Babcock & Wilcox Co.

The research committee on fatigue of metals, Prof. H. F. Moore, chairman, referred at some length to a recent paper by H. J. French (International Nickel Co.) describing a method for plotting a "probable damage" diagram, to locate combinations of stress and number of cycles below which no apparent damage is done to a given metal. Several members of the committee are carrying on tests to determine such a "damage line" for various metals, and the committee would be glad to communicate with any laboratory worker who feels that he could aid in this study.

The committee is not at all certain that the fatigue test has any great future as a test for acceptance or rejection of a metal. It is uncertain that standardization of methods would be of any great advantage at the present time on the score that premature standardization hinders rather than helps research work.

Caustic Embrittlement of Boiler Steel

Embrittlement of boiler steel caused by the use of "unbalanced" waters has been detected in about sixty generating stations since 1930, involving a part or total failure of approximately 175 boilers, according to Sheppard T. Powell, consulting chemical engineer, Baltimore. Mr. Powell was the Edgar Marburg lecturer at this year's meeting and chose as his subject, "Water as an Engineering and Industrial Material." In the course of his monograph, which had to do largely with testing water and made startling observations on deleterious conditions obtaining with many community water supplies, he touched on the influence of water on cracking of boiler steel.

In the case of the boiler steel embrittlement, he estimated the cost of replacement or repairs as not less than $800,000, and said a conservative

W. H. BASSETT,
New President of the Society.

estimate of the total value of the boiler equipment in the plants affected during the period is close to $5,000,000. The plants were distributed in some 22 States, and the losses were not restricted to any type of water conditioning, but occurred from all types of waters where the concentration of sulphates in the boiler water salines has been too low to furnish the necessary protection against caustic attack.

"Caustic embrittlement," said he, "is the destructive chemical attack by caustic soda on the boiler steel under stressed conditions and may occur when boiler water salines contain high concentrations of caustic soda and relatively low concentrations of sulphates. The failure of steel occurs in areas of greatest stress, namely, in riveted sections of boilers."

All cracks, he continued, are not due to the use of poorly conditioned water, but where cracks develop the cause should be definitely allocated and the conditions thoroughly investigated. Adequate protection will be effected by the maintenance at all times of specific ratios of sodium sulphate to total alkalinity. The desired ratios vary with the boiler pressures maintained, varying from one of total alkalinity to one of sodium sulphate up to 150 lb. pressure to as high as three of sodium sulphate to one of total alkalinity in the boiler water salines above 250 lb. pressure.

The destruction of steel by embrittlement is insidious, he asserted, and frequently when discovered "has advanced so far as to require abandonment of the boilers. If the caustic action is limited to riveted holes and discovered in time, the holes may be reamed and oversized rivets used. Frequently, however, steel has been so seriously damaged as to require complete replacement of the boiler drums or the entire unit. The characteristic appearance of steel subject to caustic embrittlement shows fine hair cracks radiating into the metal from the periphery of the rivet holes. In the advanced stages the cracks may carry continuously from one rivet hole to another. In one installation, examined recently, a section of plate was cracked for a distance between 48 rivet holes."

In concluding this phase of his subject, he mentioned the magnifying periscope designed by J. P. Morrison, of the Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn., to take a picture of a suspected area.

New Standards for Corrosion-Resisting Steels

The committee on the iron-chromium, the iron-chromium-nickel and related alloys submitted a specification, as a tentative standard, for welding of the 18-8 steels and reported progress on other specifications, including one for sheet products that will be ready in a month or two. C. C. Snyder, of the Central Alloy Division of the Republic Steel Corpn., was made chairman of the subcommittee having this last mentioned item in charge. F. B. Foley, Midvale Co., reported on the activity toward a standard for wrought products, covering forging stock and bars. Considerable work has been done on classes and grades in the case of castings, and the general committee, A-10, voted that a committee on specifications for the alloy tubing be appointed.

It was decided to feature at probably the next annual meeting of the society, that to be held in Detroit, in June, 1935, a symposium on troubles encountered with heat and corrosion resisting alloys in both fabrication and use; the session to be devoted to this subject, it seemed to be the sentiment of the committee, should be informal rather than formal, all with the idea that on failures being reported, some light could be placed on the causes of the troubles and views then crystallized as to the materials that should perchance have been selected, on the score that the shortcomings are often the result of misapplications.

Another of the noteworthy contributions of Committee A-10 was a special report on the polishing and etching of the alloys coming under the purview of the committee, this report prepared by J. R. Vilella, of the Union Carbide and Carbon Research Laboratories.

Jerome Strauss, Vanadium Corpn. of America, Bridgeville, Pa., was reelected chairman of the committee for the next two years. The other committee officers were likewise reelected, as follows: H. D. Newell, Babcock & Wilcox Co., Beaver Falls, Pa., secretary; T. H. Nelson, consulting metallurgist, Philadelphia, vice-chairman.

One of the important statements coming from the committee on cor-

rosion of iron and steel was made by R. F. Passano, American Rolling Mill Co., as chairman of the subcommittee on field tests. It was in substance that failure was a function of the weight and distribution of the protective coating and not on the composition of the metal. The life of a coating material was proportional to the weight of the coating, increasing as the weight of the coating increased. Zinc is showing up as a better medium of protection than cadmium and both are proving better than copper, chromium, etc.

Plans are under way to test plain and coated wire, including stainless varieties, in various gages and in different localities.

Little or no trouble with embrittlement of galvanized material of the structural grades is found provided the base is of open-hearth manufacture and there has been proper annealing.

F. F. Farnsworth, Bell Telephone Laboratories, was elected chairman of A-5 on corrosion, succeeding the late J. H. Gibboney.

The foregoing summarizes the highlights of the activities of the various committees, particularly those in the ferrous field, and in later issues will be reviewed, as the opportunity presents itself, some of the various papers contributed by individuals.

George M. Verity Appraises Prof. Tugwell

(Continued from Page 35)

It is evident that Prof. Tugwell and his associates have secured many of their views and mistaken understandings of the policies and plans of modern industry from organized labor leaders.

The great weakness in the plans and policies of organized labor is that they are living in the 50 years ago when strife and conflict in industry was the regular order of the day. They, however, evidently think well of that policy as applied to their own progress, as they are bending every possible effort to have legislation enacted that would result in a perpetual condition of conflict in every workshop in the land.

Prof. Tugwell says that exploitation of workers and customers must cease under the New Deal. He, like some others in Washington, seems to be thinking in terms of the "sweat shop," which has no more relation to modern industry than industry has to our penal institutions.

That portion of modern industry which stands for anything at all, and which has made any place for itself in this outstanding industrial age, does not exploit men, for cooperation, the modern watchword of industry, can have no relation to exploitation, men and management must work together in confidence and good will and in their common interest, or economic forces would soon displace them.

Prof. Tugwell discusses the factor of experimentation at great length. He affirms that industry has always depended on experiments for its development and admits that it is essential if we are to hold our place in the sun.

Alexander Thomson, president of the Ohio Chamber of Commerce, in discussing that statement recently said: "Industry does and must experiment, progress can be made in no other way, but it does its experimenting in the laboratory where it is under control and not where production is being carried on."

Prof. Tugwell says that some of industry's experiments have been good and some have not. That is unfortunately an essential of human life that can never be changed, but industry could never have grown to its present status unless its experiments had been successful in a large majority of cases.

Prof. Tugwell further said that "Industrial experimentation has made men's lives insecure and the price we have paid for free experimentation in industry too high to be tolerable."

Industry must experiment with materials and methods but it does not experiment with men. I have never heard of any free experimentation in modern industry, as it is one of the most expensive undertakings that industry must carry on.

Prof. Tugwell states that "the critics say that the Government ought not to experiment because it destroys business certainty," but that he "cannot see how there can be objections to a method which was forced on the Government by the effects which were felt from the same method used elsewhere."

In other words, he feels that if business may experiment that Government should be privileged to do the same thing.

When a unit in industry does experimental and research work, as President Thomson stated, it does it in the laboratory and it does it at its own expense and not at that of the public or the Government. It is the price it pays for its own progress and existence, for an experimenting group cannot secure any more for their products than does a competitor who does no development work at all. The developer in industry and in every other field of effort must simply depend upon the more commanding place he can make for himself through new contributions to civilization.

There is, however, one great difference in this whole problem of experimentation that Prof. Tugwell seems to have overlooked and it is a very vital one.

In all of its experimentation industry is guided by costly experience. Before beginning a new development it knows that certain fundamentals must be respected and just what factors and materials can be used, and where it is not safe to use other factors. It must try new ways, but it is always guided by experience. It cannot work in a haphazard manner or try things that are known to be unworkable or dangerous if attempted.

The group of young intellectuals in Washington who are dealing with both the social and economic life of the nation, are without any practical experience to guide them. Their plans are based on theory and book knowledge.

Every practical man knows that there are many beautiful theories in economics and in the arts and sciences that will not work, and that it is simply butting one's head against the proverbial stone wall to attempt to put them into effect.

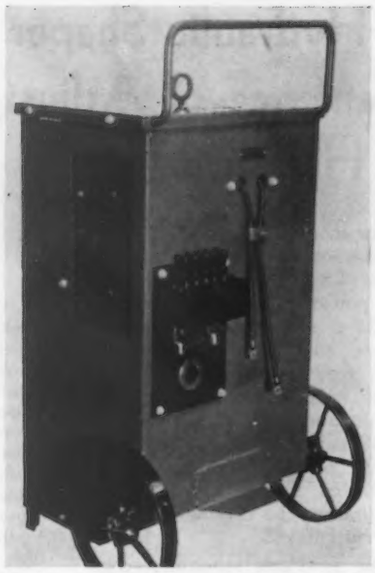
Walter Lippmann in a recent article, in which he was discussing Prof. Tugwell's Washington defense of the Brain Trust's interests and plans, very aptly said: "It was not a matter of intent or purity of purpose at all, it was rather a matter of the soundness of the plans and policies advocated. If the business life of the nation feels that the Administration is being too largely influenced by unsound and unworkable plans all of their good intentions go for nothing. A man is just as dead after suicide as if he were murdered."

Another great weakness in the thinking and planning of this group of young professors, who have so suddenly and dramatically come into such great power, without having been elected to any Federal office, is that in their great enthusiasm for their social and economic reforms, they seem to believe that the world can be made over in a day, so to speak.

They propose to remove all the known evils, all of the maladjustments and inequalities of life and of business in one fell swoop. No revolution in all the world ever accomplished or ever will produce any fraction of any such result.

We progress through evolution and not revolution. We must be refined through patient education, earnest endeavor and intelligent direction, we must remove one evil or one weakness at a time and then go on to the next.

Progress comes through evolution and not revolution.



THE 750-amp., 40-volt A.C. welder complete with control is pictured at the left. The smaller A.C. unit (above) is for welding light-gage material, including stainless and other alloy steels.

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Large Transformer-Type A. C. Welder

A SINGLE-OPERATOR transformer-type alternating current welder rated at 750 amp., 40 volts, is shown complete with control in the accompanying illustration. It was designed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, for either hand welding or continuous service as generally encountered with the automatic welding process. A unique control feature reduces automatically the open circuit secondary voltage when not welding, thus permitting, it is stated, the most desirable arc striking characteristics.

Illustrated also is a smaller type of alternating current welder offered by the Westinghouse company for arc welding light-gage material, including stainless and other alloy steels. Operating characteristics are said to prevent burning through thin sections of material and yet provide ease in striking and maintaining a stable arc.

Multiple-Tool Base Saddle for Engine Lathes

A SPECIAL production saddle for use with regular 13, 16 and 18-in. swing screw-cutting precision engine lathes has been developed by the South-Bend Lathe Works, South Bend, Ind. Called the multiple-tool-base saddle, this saddle is primarily for mounting special tool-holding blocks for multiple-tool machining work. It has a wide dove-tail for mounting a slotted table which may be equipped with blocks at both front and rear.

The illustration shows a set-up for a turning and necking job, the front tool-block having four turning tools for turning four diameters, and the rear block having three parting tools for shouldering and necking. The saddle is connected with the automatic longitudinal feed and has automatic cross-feed. Micrometer cross-feed stops for front and back tools permit highly accurate production work. An automatic stop is provided for the automatic longitudinal feed.

A variety of other multiple tool set-ups for machining can be employed. Motor shafts, pump shafts and other parts having several diameters can be machined in one set-up. In addition to handling multiple-tool production work, the slotted table may be used as a clamping table for milling, boring, reaming, drilling, and other operations.

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Multiple-tool base saddle applied to 16-in. engine lathe for turning and necking operations.

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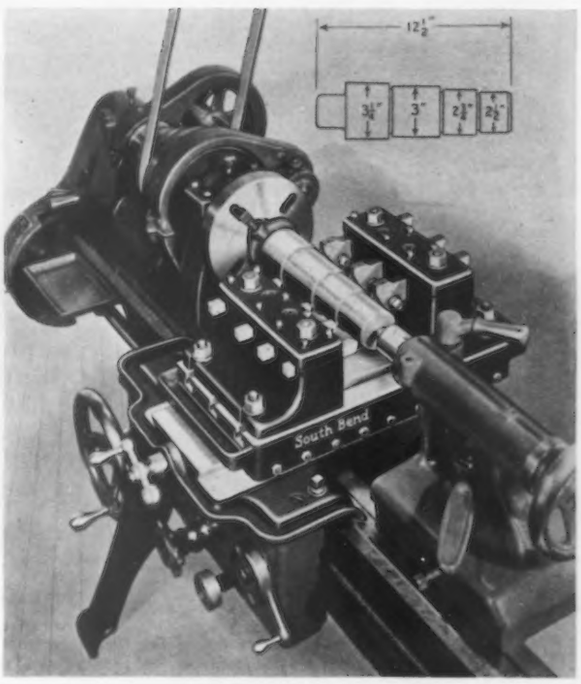


New Hydraulic Shaper Features Convenience of Adjustment And Handling

IN the new model Hy-Draulic shaper being announced by the Rockford Machine Tool Co., Rockford, Ill., hydraulic power is applied close to the ram in a straight line directly back of the tool as in the earlier model, but for the feeds and rapid traverse it is now applied directly to the table and rail without intervening mechanism, in a manner similar to that of the ram drive. A flange mounted motor, arranged as shown, replaces the former motor-on-base arrangement.

As in the previous machine, economy is attributed to more direct application of the power and more efficient transmission. Moving parts are light in weight and stationary parts are heavy, a construction emphasized as increasing the strength and rigidity as well as saving power. Operating time is saved by additional convenience of adjustment and handling.

Hydraulic power controls are grouped in a panel on the operating side, forming a complete unit. The ram reversing mechanism (*A*) has been simplified and improved. The feed selector (*B*) now resembles a radio dial instead of a micrometer barrel. The table and rail support are clamped by a single movement of levers (*C*) and (*D*), instead of by several movements of a separate wrench on clamping nuts or bolts. The stop for the cross-feed now has micrometer adjustment which can be set to remove any desired quantity of metal within 0.001 in. or probably less, and then the feed stops automatically.

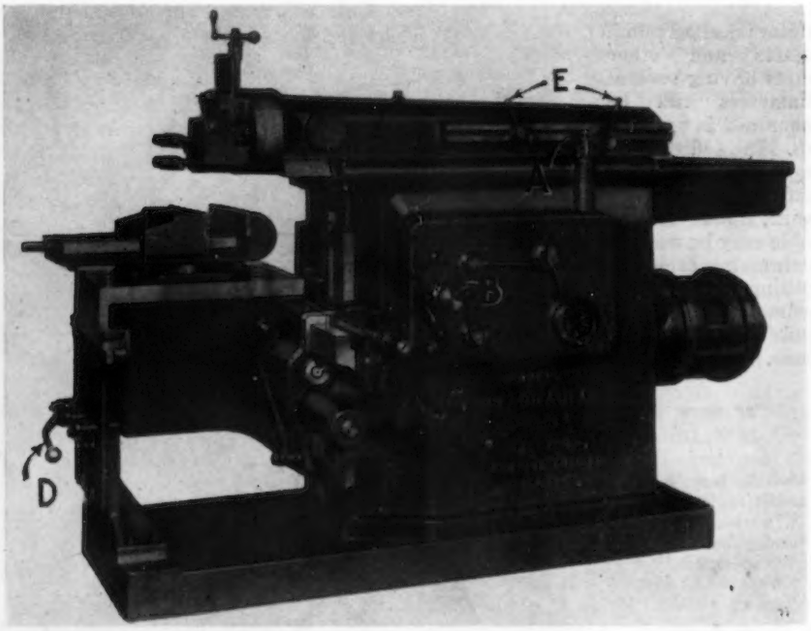
Cutting speed is uniform and cutting pressure is constant from beginning to end of cut. Reversal of the ram is rapid, smooth and shockless, and the return speed is constant regardless of stroke or cutting speed. The ram drive mechanism is simple and self-lubricating.

The number of feeds is unlimited up to the maximum, and any feed can be selected instantly. Feed movement cannot begin until the tool has cleared the work on the return stroke. The feed is smooth, positive and is easily adjusted while the ram is in motion.

Simplicity of stroke control is a feature. A pair of dogs (*E*) governs both the stroke length and its position relative to the work. They can be adjusted quickly and safely without tools and while the ram is in motion. Altering the stroke length does not change the cutting speed. A ball handle at the right of feed selector permits the operator instantly to reverse the direction of ram travel at any point even when the tool is making a heavy cut.

Specifications

	16-IN. HEAVY	24-IN. HEAVY
Stroke, actual length..	17 in.	25 in.
Standard Pattern.....	20 or 24 in.	28 or 32 in.
Stroke, minimum.....	1 in.	1 in.
Constant Ram Return Speed—ft. per min..	193	185
Cutting speeds—ft. per min.	0-144	0-120
Table travel, horizontal	16 in.	20 in.
Table travel, vertical..	10 in.	13 in.
Cross feed, any from.	0 to 250 in.	0 to 250 in.
Vertical feed to head..	7 in.	7 in.
Size of 1200 r.p.m. motor	5 hp.	10 hp.
Net weight, approx.—less motor.....	4200 lbs.	6300 lbs.



Hydraulic power for the feeds is now applied directly to the table and rail in a manner similar to that of the ram drive. Hydraulic controls are grouped in a panel on the operating side.

Helmet for Welding In Confined Spaces

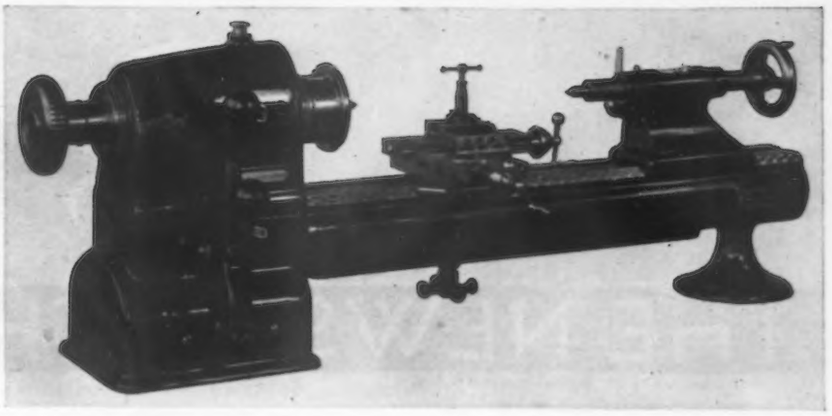
FOR welding in confined spaces, such as tanks, ship hulls, fire boxes and the like, the American Optical Co., Southbridge, Mass., is offering a new welding helmet, designated as the No. 650.

The helmet is designed to fit closely to the face and sides of the head without sacrificing ventilation or causing light leaks, and is said to be cool and comfortable under the most humid conditions. The Bakelite welding glass holder is outside of the helmet and is fully dielectric. It assures the wearer freedom from burns if accidental contact is made with the electrodes while working. The added distance from the face to the welding plate permits the helmet to be comfortably worn with a respirator and also helps to prevent fogging. Noviweld glass, said to screen out more than 99½ per cent of all injurious light rays, is standard equipment.

The helmet is designed to fit closely without sacrifice of ventilation and may be worn with a respirator.

A swivel connection between the helmet and headgear provides three positive positions in which the helmet can be set when in use. Looseness, slipping and side play are eliminated. The entire unit is light in weight and can be quickly set in position.

Introduces Enclosed-Head Bench Lathes



ENCLOSED-HEAD, motor-driven, precision bench lathes featuring heavier construction, simplified operation and the entire elimination of moving belts above the bench are being placed on the market by Hardinge Brothers, Inc., Elmira, N. Y. The machines are not adaptations of cone-driven models, but are designed along new lines with speed change control levers at the head of the machine. They are approximately 25 per cent heavier than regular cone-driven models, and heavy cuts and high spindle speeds are possible. Engine lathe design tailstock is a feature.

The headstock frame is cast in one piece to enclose three endless V-belts. The speed change levers operate electrical controls to a drive which gives six forward and six reverse spindle speeds without the use of gears, clutches or loose pulleys. Five sizes of these new Cataract bench lathes, ranging from ½ to 1 in. collet capacity, 7-in. and 9-in. swing, for bench and cabinet mounting, are built.

Automatic Fuel Unit For Oil Burners

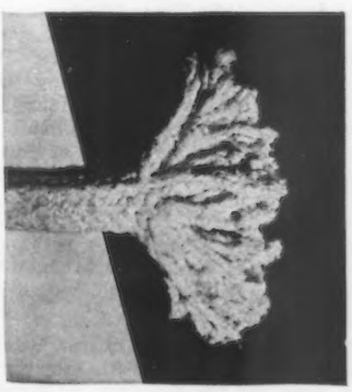
A NEW automatic fuel unit for pressure atomizing oil burners has been added to rotary pump line of the Sundstrand Machine Tool Co., Rockford, Ill. It consists of a variable displacement pump and a strainer, the pump automatically taking care of the work done by valves and thus eliminating the valve mechanism previously required to operate a pressure-type oil burner.

This new pump displaces with no by-passing only as many gallons of fuel per hour as is determined by the nozzle size, the pump automatically pumping the correct volume without requiring any adjustment for different sized nozzles. Automatic air relief or air bleed is also incorporated.

Advantages claimed include quiet running pump, with very low power consumption, as only the fuel that is actually burned is pumped. The unit is small and compact, and has few parts. Other features include full pressure and volume at the start of combustion, with instantaneous and positive cut-off of oil to the nozzle, preventing dripping of oil when the burner is stopped. The seal is a mechanical seal. Pressure adjustment is provided.

Braided Asbestos Rod Packing

FOR reciprocating and centrifugal rods, Johns-Manville, 22 East Fortieth Street, New York, is offering a new packing designated as the "interlocked braided asbestos." Each



strand of the long fiber asbestos yarn is interlocked in the braiding to provide a packing with a completely integral braided structure. It is stated that there are no soft, heavy plaits to flatten, no jackets to wear through, and that because the material is braided square, rather than pressed into shape, a better packing face on the rod is assured, with more contacting area.

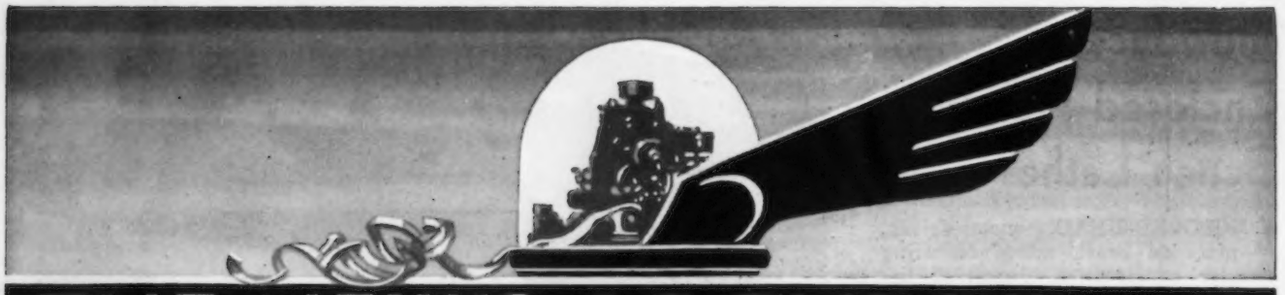
The interlocked braided material is recommended by the makers for packing against saturated or superheated steam; hot or cold, fresh or salt water, and weak caustics and acids.

New Diaphragm Motor Type Control Valve

FOR use primarily on air-operated control systems, the Bristol Co., Waterbury, Conn., is offering a new Synchro diaphragm motor valve. The

valve responds immediately to air pressure changes, and the stem position for a given pressure is the same whether pressures are rising or falling. There is said to be no hysteresis or friction loss in the top movement. The construction simplifies maintenance and servicing. Ample space is provided for renewing stem packing without disturbing the adjustments, and the top may be renewed or the spring replaced without changing the setting of the spring follower.

Union and valve bodies of either V-port or single-seated construction are available, with body material and trim for almost any industrial process.



THE NEWS OF THE WEEK

British Steel Makers Seek Exports; Domestic Trade Lags

LONDON, ENGLAND, July 2 (*By Cable*).—New business in pig iron is quiet and little improvement is anticipated during the summer. Autumn, however, is expected to reflect an expansion in demand.

As a result of the slowing down in domestic demand, British pig iron producers are making extra effort to secure export business in order to avoid becoming over-produced. They find, however, that price concessions are necessary.

Hematite demand continues to be steady and the current heavy production is promptly consumed.

Continental competition for semi-finished steel is less pronounced, but this is offset by a relaxing of home demand. Sheets, in addition to lack of home orders, are suffering in foreign markets from high prices. Structural steel is active and rail mills are busy, but shipbuilding requirements for finished steel are slack. Export demand for finished steel in structural and rail classifications is increasing.

The meeting announced last week in Paris at which it was hoped to effectuate an international tin plate agreement has been adjourned until Thursday of this week in London. Favorable progress is reported and a definite agreement is expected. In the meantime, British tin plate business is quiet with home consumers well covered but with export inquiries good. Fair business may develop when and if the expected quotas and prices are established.

A new Anglo-French agreement has restored United Kingdom's tin plate quota to 100 per cent of its proportionate share.

Continental iron and steel demand is quiet, although United Kingdom has placed some interesting forward contracts for semi-finished steel. Merchant steel is fairly active but plates, sheets and tubes are dull. Business with South Africa and the Argentine is slightly better, but Scandinavian markets are slow.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9
Billets, open-hrth.	£5 10s. to £5 15s.
Tin plate, per base box	17s. 3d. to 17s. 6d.
Steel bars, open-hearth	£7 17½s.
Beams, open-hrth.	£7 7½s.
Channels, open-hearth	£7 12½s.
Angles, open-hearth	£7 7½s.
Black sheets, No. 24 gage	£9 5s.
Galvanized sheets, No. 24 gage	£11 5s.

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.

Billets, Thomas	£2 7s.
Wire rods, No. 5 B.W.G.	£4 10s.
Steel bars, merchant	£3 5s.
Sheet bars	£2 8s.
Plates, ¼ in. and up	£4
Plates, 3/16 in. and 5 mm	£4 2s. 6d.
Sheets, ⅛ in.	£4 7s. 6d.
Beams, Thomas	£3 2s. 6d.
Angles (Basic)	£3 2s. 6d.
Hoops and strip base	£4 2s. 6d.
Wire, plain, No. 8	£5 7s. 6d.
Wire nails	£5 15s.
Wire, barbed, 4-pt. No. 10 B.W.G.	£8 15s.

C. C. of U. S. to Study Emergency Legislation

THOROUGH examination of emergency legislation and its effects will be made by the Chamber of Commerce of the United States under a program for the coming year adopted by its board of directors. The program, just formulated by the board, and announced by Henry I. Harriman, president of the Chamber, looks forward to the ending of emergency measures and contemplates the bringing to bear of informed judgments as to any features of these measures which should be reshaped for permanent use and as to those to which a definite end should be put as quickly as possible.

"As recovery draws nearer," said Mr. Harriman's statement, "the time has come for the Chamber to devote its major attention toward the formulation of policies for use in the future, when full responsibility has been returned to private initiative and private enterprise. The Chamber, therefore, has before it during the coming months the duty of examining the effects of legislation enacted and of making recommendations respecting continuance of, changes in or abandonment of recent economic measures now in operation.

The Chamber's program, as announced, lists 10 major subjects to which the Chamber will give attention. As the year progresses the program will be adjusted as seems desirable, new subjects being added if that appears necessary.

The subjects selected by the Chamber's board are:

National Industrial Recovery Act.

Situation of Capital Goods Industries.

Development of Agricultural and Land Policies.

Social Reserves—Against Old Age, Unemployment, Sickness and Disability.

Federal Financial Problems.

Banking Facilities and Services.

Policies of Foreign Trade Promotion.

Further Development of Natural Resources.

Relations of Government to Transportation and Communication.

Merchant Marine Development.

One Year of NIRA In New England

MORE than 850 New England manufacturers, operating under 125 codes and employing more than 240,000 workers or 22 per cent of the 1,098,514 workers employed in manufacturing in New England (in 1929), responded to the inquiry conducted in June by the industrial committee of the New England Council as to the values and defects of the NRA according to the individual manufacturer's experience with the code operation in his plant and in his industry.

Of the 859 manufacturers' replies received in time for inclusion herein, 44 per cent say that their codes have proved generally helpful, 43 per cent of no effect, and 8 per cent hurtful, in eliminating unfair competitive practices.

Forty-six per cent report that their codes have proved generally helpful, 40 per cent of no effect, and 8 per cent hurtful in reducing and relieving unemployment.

Reports on major provisions of codes show the majority found maximum hours of labor hurtful; minimum wages helpful; and collective bargaining, wage differentials, restriction against selling below cost, price stabilization plans, and limitation of productive capacity of no effect in or on their respective businesses.

When asked whether or not the manufacturer regarded some form of business code permanently desirable or essential either with or without government sanction or supervision, 822 responded, and 79.6 per cent of them answered this question affirmatively. Only 20.4 per cent said they do not want any kind of a code. Forty-two and five-tenths per cent desire a code with government sanction and supervision, and 35.4 per cent desire a code without government sanction and supervision. One and seven-tenths per cent say "desirable under either situation." Of these 822 manufacturers, 18.4 per cent rate themselves as large units, 44.5 per cent as medium-sized, and 37.1 per cent as small units in their respective industries.

Forty-four per cent of the original 859 are satisfied with the compliance given their codes — 37 per cent are not. To improve compliance, a substantial number say "better enforcement," but very few outline how or in what way better enforcement might be obtained.

Segregation of small manufacturers' replies (323) show their opinions and experiences differing from those of the large and medium-sized firms in two major instances. The larger number of small manufacturers, 149, or 18 per cent of the 859, say that they found their codes of no effect in eliminating unfair competitive practices or relieving and reducing unemployment. The majority of small manufacturers are opposed to codes with government sanction and supervision in contrast to the majorities of large and of medium-sized manufacturers who prefer codes with government sanction and supervision. In all other matters the majority of small manufacturers concur with the opinions and experience expressed by the majorities of the large and the medium-sized firms.

Among those checking specific provisions as either of no effect or hurtful, 29 per cent of the 859 favor elimination, and 19 per cent amendment of the maximum hours of labor provision in their codes; 15 per cent elimination, 14 per cent amendment of the minimum rates of pay provision; 20 per cent elimination, 9 per cent amendment of wage differentials; 32 per cent elimination, 8 per cent amendment of the collective bargaining provision; 31 per cent elimination and 7 per cent amendment of limitations of capacity; 17 per cent elimination, 10 per cent amendment of their industry's price stabilization plans; while 15 per cent favor amendment and 13 per cent elimination of their restrictions against selling below cost.

Of the total inquiries sent out, fully 65 per cent were addressed to manufacturers, and the remainder to firms engaged in other lines of business.

Only 15 per cent of the latter responded, in contrast to 30 per cent of the manufacturers.

The "other than manufacturers" group included newspaper publishers, wholesalers, retailers, construction interests, a few selected trade and industrial organizations, and a number of trade association executives.

American Cyanamid Acquires Burton Co.

AMERICAN Cyanamid & Chemical Corpn. announces the acquisition, effective July 1, 1934, of the plant, properties, and business of Burton Explosives, Inc., Cleveland. The latter company, since its organization in 1930, has been engaged in the manufacture and sale of high explosives and blasting supplies.

J. S. Burton, president of Burton Explosives, Inc., brings to the American Cyanamid organization an extensive knowledge of the explosive business together with a manufacturing and sales organization of experienced men. Mr. Burton has been connected with the industry since 1895.

The business of Burton Explosives, Inc., will be carried on as the Burton Explosives division of the American Cyanamid & Chemical Corpn., 30 Rockefeller Plaza, New York.

Krueger Tool & Machinery Co. Formed at Detroit

H. R. KRUEGER has announced formation of the Krueger Tool & Machinery Co., which has established a manufacturing plant at 1469 East Grand Boulevard, Detroit. The new company has been appointed sales representative in the Detroit district for the W. F. & John Barnes Co., Rockford, Ill., builder of semi-automatic lathes and vertical and horizontal drilling machines. The Krueger company will design and build the multiple heads and the complete tooling for the Barnes machines, assembling the tooling to the machines at its own plant and demonstrating the machines to customers on its own floor. It also will build special machinery and do general jobbing work. Mr. Krueger recently has been vice-president in charge of engineering of the Ex-Cell-O Aircraft & Tool Corpn., Detroit, and previously was head of H. R. Krueger Co. Howard J. Snell, formerly with the Ex-Cell-O company and with the Krueger company, will be associated with Mr. Krueger in his new company. Production started on July 1.

Creditors Aid Bond Reorganization

HOLDING that the increased volume of sales of the Bond Electric Corpn. warranted a continuation of this company's business without interruption, a new committee representing creditors and debenture holders of the company, which has been in receivership since May 22, 1933, petitioned the United States District Court in Newark recently for reorganization of the Bond interests.

This petition, it is believed, is the first of its kind filed for reorganization by creditors in New York or New Jersey Districts under the recent amendment to the Federal Bankruptcy Act signed by the President on June 7.

The creditors filing the petition are: Bridgeport Brass Co., Spaulding Fibre Co., and Snyder & Black, Inc.

Previously the State Court had ordered the receivers to present a plan for liquidation, which they did, and recommended the sale of the business as a going concern.

The receivers since May 22, 1933, have been C. Bertram Plante and L. Edward Herrmann.

R. E. Flanders to Head Mechanical Engineers

NOMINATIONS for officers of the American Society of Mechanical Engineers for 1935 were announced at a meeting of the nominating committee held at Denver last week. Election will be held by letter ballot of the entire membership, closing on Sept. 25. The nominees are as follows:

President, R. E. Flanders, president Jones & Lamson Machine Co., Springfield, Vt.

Vice-Presidents, E. W. O'Brien, editor *Southern Power Journal*, Atlanta; James H. Herron, president James H. Herron Co., Cleveland, and H. R. Wescott, president Westcott & Mapes, Inc., New Haven.

Managers, B. M. Brigman, dean Speed Scientific School, University of Louisville, Louisville; Alfred Iddles, vice-president United Engineers & Constructors, Inc., Philadelphia, and J. W. Haney, professor of mechanical engineering, University of Nebraska, Lincoln.

May Fabricated Bookings Decline

ALTHOUGH bookings of fabricated structural steel during May were lower than the average monthly bookings during the past seven months, they were 48 per cent larger than bookings during the same month last year. May bookings were 35 per cent less than those of April (a record month this year), and 13 per cent less than the average monthly bookings during the first quarter of 1934, according to the American Institute of Steel Construction, Inc.

Shipments during May were 24 per cent larger than the shipments during April, 82 per cent larger than the monthly average during the first quarter of 1934, 33 per cent larger than the monthly average during the last quarter of 1933 and 29 per cent larger than during May last year. The tonnage ahead for fabrication is 42 per cent larger than at this time last year.

Shielded-Arc Electrode For General-Purpose Use

A NEW general-purpose, heavily coated electrode, the Fleetweld No. 7, for shielded arc welding of mild steel, is being announced by the Lincoln Electric Co., Cleveland. It is designed particularly for high-speed and single-pass welding, and its arc characteristics are such that it is suitable for use where the fit-up is apt to be poor. Unusually fast welding at low cost is attributed to a high burn-off rate and low spatter loss. The finished bead is smooth.

Tests of all-weld-metal specimens show tensile strength of 70,000 to 80,000 lb. per sq. in.; yield point of 55,000 to 60,000 lb. per sq. in.; and ductility (elongation) approximately 20 per cent in 2 in. Resistance to corrosion is said to be greater than that of mild steel.

Material of special composition is employed for the coating, and the metal, drawn to rigid specifications, is carefully selected and tested. The new electrode is made in diameters ranging from ⅛ to ⅜ in., inclusive, and in 14-in. lengths. The ⅛, 5/32 and 3/16-in. sizes are for welding in flat, vertical or overhead position, and the 7/32, ¼, 5/16 and ⅜-in. sizes in flat position only. The electrodes are packed in square metal containers of 50-lb. size.

Whiting Corpn. Observes Golden Anniversary

THE year 1934 marks the fiftieth anniversary of Whiting Corpn., Harvey, Ill., and finds John Hill Whiting, the founder, still active as chairman of the board. Mr. Whiting began his business career in Detroit in the seventies as a clerk in a car wheel foundry. He later rose to superintendent and earned a substantial share in the company. By this time Mr. Whiting had already developed a number of improvements in cupola construction which formed the basis for what has since become a standard iron melter. Having secured patents on this and other improvements, including a car wheel cleaning machine, the new business was launched. Additional items of equipment were developed, such as the Whiting patent straight-line car wheel system, ladles, core ovens, tumbling mills, cars, trucks, turntables, air hoists, handpower cranes, etc. The Detroit Foundry Equipment Co. proved that there was a market for standardized, scientific foundry equipment.

In 1894, a small portion of the present plant at Harvey, Ill., was built and began to do business under the name of Whiting Foundry Equipment Co. (later this name was changed to its present form—Whiting Corpn.). As a leading manufacturer of cupolas and foundry equipment, the company acquired a national reputation, and gradually other lines were added: electric traveling cranes, special shop equipment for railroad terminals, and a variety of special machinery for power plants, steel mills, by-product coke plants, etc. The first successful gasoline motor trucks for commercial use were designed and built in the Whiting plant as far back as 1904.

As time went on, other companies were taken over as subsidiaries, including the Swenson Evaporator Co., manufacturer of evaporators, crystallizers and filter equipment for the process industries; the Grindle Fuel Equipment Co., one of the pioneers in pulverized coal machinery; and the Joseph Harrington Co., manufacturer of automatic stokers for industrial and commercial use. The latest addition is a complete line of stokers for domestic and commercial use.

Closely associated with Mr. Whiting for the past 30 years and now president of the corporation, is Gen. T. S. Hammond. Along with his service to the company, Gen. Hammond has participated very widely in business association activities and military affairs, including service in France with the Rainbow Division. He was one of the first to be called to Washington for duty with the NRA.

The third generation is represented by Mr. Whiting's grandson, Stevens H. Hammond, assistant to the president.

Calls Age Deadline In Industry a Myth

GROWING belief among aging workers that industry has an "age deadline" at about 45 years is a myth, in the opinion of G. Powell Hamilton, Equitable Life Assurance Society, New York, who recently addressed a joint meeting of the Wisconsin Industrial Relations Association with the Milwaukee Metal Trades Association in Milwaukee. Mr. Hamilton said that in 1929 one of the vice-presidents of the Equitable Life gathered data on the subject from 516 group insurance clients and found that 8.5 per cent had a rigid hiring deadline, while 10.3 per cent expressed opposition to a maximum hiring age limit for any cause. The study showed a further group of 23.7 per cent having no rigid hiring limit.

Mr. Hamilton said Government employment figures indicate that in industry employment of men above 45 has been increasing in the last 40 years, and in certain industries a similar increase has been unusually rapid. In the steel industry, he said, the proportion of persons 45 to 54 years of age has increased 61 per cent in the last 20 years; from 55 to 64 years the increase has been 142 per cent, and 65 and over, 143 per cent. A study made in 1928 in four public employment offices in Massachusetts revealed, Mr. Hamilton said, that there was no discrimination against older persons until 55, and that persons of 55 to 64 years had, on the average, about three-fourths as much chance of getting a job as a person under 35.

THE WEEK IN WASHINGTON

Steel Labor Board Makes Its Bow

Plan Represents Special Formula for Steel Industry, Not General Labor Panacea

By L. W. MOFFETT
Resident Washington Editor, The Iron Age

WASHINGTON, July 3. — Organized last Friday, one day after announcement of its appointment, the National Steel Labor Relations Board has taken up quarters and begun work in the Department of Labor. Comprised of three impartial members, each well known for achievement in the field of labor arbitration, the board is headed by Chief Justice Walter P. Stacy of North Carolina and the other members are Admiral Henry A. Wiley, U. S. N., retired, and James Mullenbach of Chicago.

Set up under the Wagner joint resolution, the board already has before it many records in connection with the threatened steel strike situation. Most of them are understood to consist of material supplied by the Amalgamated Association of Iron, Steel and Tin Workers in support of its demands as outlined at its Pittsburgh convention last spring together with supplementary material growing out of the recent convention in Pittsburgh. These demands, with pressure from the more militant group of the association, included the 6-hr., 5-day week with a minimum wage of $1 per hour for common labor, a proposal that never was taken seriously by the more conservative leaders of the association, much less by the industry itself.

They were raised, however, with insistence and with the threat of a strike unless they were granted. President William Green of the American Federation of Labor, called upon by President M. F. Tighe of the association, appeared dramatically at the recent Pittsburgh convention and did just what the convervative leaders wanted him to do, succeeded in checking the more militant forces and declaring for a postponement of the strike, seeing its futility. Meanwhile the convention becoming milder in tone set forth a modified plan, including the setting up of a three-man impartial board, a plan which, despite the scorn with which the Association treated it, was largely similar to that agreed upon between the American Iron and Steel Institute and General Hugh S. Johnson, NRA administrator.

Wide Latitude

With passage of the Wagner resolution, President Roosevelt was given a wide latitude to handle the situation and took it up through Secretary of Labor Frances Perkins. He gave her sole power to negotiate between organized labor and the American Iron and Steel Institute and she conducted the negotiations in a highly successful manner, arranged for a high-grade board that is neutral and a plan that is a compromise on the part of both the steel industry and organized labor. It marks a new step in relations between the industry and organized labor, though it does not mean recognition.

The steel labor board is to be temporary and is a part of the Department of Labor. This is in line with the new labor policy, for the organization succeeding the National Labor Board is transferred to the Labor Department, a triumph for Miss Perkins. While the National Labor Board was not an integral part of the NRA it was housed in the Department of Commerce with the NRA and was closely associated with it, more closely than it is probable the new central board will be under the jurisdiction of Miss Perkins.

The steel labor board, as announced by the President in a statement which accompanied his executive order setting up the board, is to determine alleged violations of the collective bargaining (Sec. 7-a) section of the National Recovery Act. It is empowered to mediate, arbitrate, and to conduct labor elections. Both sides, the steel industry and the Amalgamated Association, have accepted jurisdiction of the board.

Powers Adequate, Says Perkins

Miss Perkins expressed the view that the establishment of the board with the broad powers it is given is adequate to solve the problem raised by the resolution adopted by the Amalgamated Association of Iron, Steel and Tin Workers at their Pittsburgh convention. She has laid before the board the body of complaints which she said had been made to her by the Association and these together with points made at the Pitsburgh convention are expected to receive first consideration at the hands of the board.

The authority given the board by the Presidential order covers the so-called complaints rather fully. It also embraces virtually the same powers that would have been given the proposed three-man impartial board which the American Iron and Steel Institute had accepted but which was junked by the Amalgamated Association, perhaps chiefly as a professional move to placate the militant rank and file committee. The concessions, such as

National Steel Labor Board Members Represent Long Mediation Experience

WALTER P. STACY is Chief Justice of the Supreme Court of North Carolina. He was born in Ansonville, N. C., in 1884, and is a graduate of the University of that State. He has been on the bench of the state for 28 years, and has wide experience as an arbitrator in industrial controversies. He has served on the following five railroad arbitration boards to which he was appointed by the Board of Mediation: Engineers, Southeast territory, Feb. 4, 1928; trainmen, New York Central, Jan. 24, 1931; clerks, Railway Express Agency, New York, Jan. 25, 1932; clerks, Boston & Maine, Boston, Sept. 15, 1933; clerks, Boston & Maine, Boston, Sept. 21, 1933. He also served on the following emergency boards to which he was appointed by the President: Conductors and Trainmen, 48 western railroads at Chicago, Sept. 29, 1928; four brotherhoods, shopmen, Louisiana & Arkansas railroad and Louisiana, Arkansas & Texas railroad, Shreveport, La., March 10, 1932; four brotherhoods (engineers, firemen, conductors and trainmen—Southern Pacific railroad, Houston, Tex., March 23, 1933; engineers, firemen and conductors, Delaware & Hudson Railroad Corpn., Albany, N. Y., March 1, 1934.

ADMIRAL HENRY A. WILEY, U. S. N., retired, was born at Troy, Ala., in 1867, was graduated from the United States Naval Academy in 1888, and also has had experience in industrial disputes. He served on the following emergency boards: Engineers, firemen, conductors and trainmen, Denver & Rio Grande Western, Denver, Feb. 1, 1934; engineers, firemen and conductors, Delaware & Hudson Railroad Corpn., Albany, N. Y., March 5, 1934. During the World War Admiral Wiley served with the Sixth Battle Squadron of the British fleet and became commander of the United States fleet as an admiral in 1927.

JAMES MULLENBACH was born in Houghton, Mich., in 1870, and is a graduate of Fargo College. He did graduate work at the universities of Halle and Berlin in Germany, has been a labor arbitrator for many years, serving in that capacity for the clothing trades in Chicago, beginning 1912. He has been a member of the Board of Education of Chicago and is a member of the Petroleum Labor Policy Board.

they are, made by both sides would appear to rest largely on the plan of representation for collective bargaining. The Amalgamated Association, reflecting the standard attitude of the American Federation of Labor, asked in their Pittsburgh platform that representatives selected by a majority of the employees be recognized as the representatives of the workers.

Inasmuch as both the Amalgamated Association and the American Iron and Steel Institute, through negotiations with Miss Perkins, agreed to accept jurisdiction of the board, the industry accepts majority representation as provided for in Section 3 of the executive order. However, the Amalgamated Association retreated somewhat also as may be seen in an important proviso in that section. This provision is to the effect that no individual employee or group of employees should be denied the right to present grievances, to confer with their employers, or otherwise to associate themselves and act for mutual aid or protection. Important too is the provision for elections by secret ballot, including primary elections. Employers have often charged that organized labor used coercive methods at open primaries.

Not a "Standard" Plan

This plan differs from the plan provided in the more complicated set-up of the National Automobile Labor Board with its provisions for proportional representation, seniority rights, etc. Miss Perkins made it clear that the steel plan is not necessarily to be accepted as a pattern for handling disputes in other industries. On the contrary it was explained by her that it is a formula worked out through suggestions from both the steel industry and the workers, with modifications made by the Government. Nothing, she said, was imposed on either side. Nor has either side committed itself to be bound by decisions of the board, though Miss Perkins is hopeful there will be no difficulty on this score. The plan as developed, it is seen, follows the statement made by the President when he selected Miss Perkins to handle the steel strike threat negotiations. He made the point that he was hopeful that the situation would be adjusted satisfactorily without the sacrifice of any principle.

The Wagner labor disputes resolution is highly flexible, lending itself to a wide range of plans for setting up boards each with its own method of procedure. It is therefore likely that disputes in the different industries will be handled through various methods of procedure, rules and regulations. Miss Perkins pointed out that the fundamental principles are of course the same, the effectuation of the law. The boards are called upon to see that the purposes of Section 7-a covering the right of collective bargaining are made effective. The board is of temporary character.

Wagner and Green Pleased

Senator Wagner said the plan does not contemplate either the closed or open shop and is not meant to favor organized labor unions or company unions but is intended to be fair to all concerned. He expressed pleasure at the personnel of the board and, like others, praised Miss Perkins for conducting the negotiations with the steel industry on the one hand and organized labor on the other. Likewise she was widely credited with a real achievement not only by reason of the plan devised but also because of the high-grade character of the men making up the board, none of whom has any personal interest in either side, the industry or organized labor.

Mr. Green was guarded in his statement but said the federation would cooperate with the board in bringing about settlement of all grievances.

"Information available indicates that all the members of the board have had experience as arbitrators in industrial disputes," said Mr. Green, "and through service rendered as mediators in the settlement of grievances which have arisen between groups of employers and employees. The experience thus gained ought to equip and qualify each of them to render constructive service as members of the National Steel Labor Relations Board."

Organized labor, however, is understood to be well satisfied on the whole with the plan. Not only because of the proposal for majority representation but also for permitting an "organization" to be designated to bargain collectively, the organization meaning a union, though it does not have to be recognized as such.

A statement issued by the American Iron and Steel Institute late Friday indicates the Institute's belief that the National Steel Labor Relations Board appointed by President Roosevelt will command public confidence and receive the cooperation of the individual steel companies. The statement follows:

"It is recognized that the making of an order under the Joint Resolution is within the discretion of the President and that it does not call for agreement or acquiescence by the parties affected, either employers or employees.

"But with the selection of an impartial board of high order which will command the confidence of the public, the employees and the employers, the cooperation of all interests should be secured.

"Without speaking for individual companies which have entire freedom of action, it is our belief from opinions already expressed that they will cooperate with the impartial efforts of such a board to bring about a peaceful determination of any controversial issues properly submitted to its good offices."

From the left — James Mullenback of Chicago, member of Labor Policy board of the Petroleum Administration board; Rear Admiral Henry A. Wiley, U. S. N. Retired; Chief Justice Walter F. Stacy of North Carolina Supreme Court.

Presidential Price Order Seen As Code Nullifier

WASHINGTON, July 3—Consternation has been created in the iron and steel and industries generally by the executive order issued last Friday by President Roosevelt which in effect calls for price reductions by as much as 15 per cent. Not alone would these slashes be made available to municipal, State and Federal Governments, but to all buyers. As viewed by industries the startling order strikes at the very foundation of the National Recovery Administration. It is held to be a code-smashing fiat. Inviting, if not actually commanding, slashes below code prices, the order is looked upon as taking away all incentive for codes, and calling for the return of destructive price cutting, with the Government itself leading the movement, and attacking its own creature, the NRA.

A Complete Surprise

Coming with startling suddenness, the order has left code authorities and their industries in a quandary. There was not the slightest advance inkling that the President was contemplating such sweeping action and therefore no preparation to avert it, or at least to have it modified. It is clear that neither General Hugh S. Johnson nor any other NRA official was consulted about the plan. Rather it is stated that it was urged by a certain cabinet official or cabinet officials who have long protested against identical bids. There was especial complaint made last week by both Secretary of the Interior Harold L. Ickes and Secretary of War George Dern against identical cement bids. Likewise protests have come from Government authorities that on many products bids not only are identical but have been boosted out of all reason. This view is shared by many industrialists themselves whose industries have not taken advantage of codes and their provisions to kite prices to extreme limits. They feel, however, that those who have resorted to this practice should be punished without applying a principle that turns upon all industries affected by the order.

Some Industries Exempt

There are some important units not affected. Prominent among them is the automobile industry whose code does not carry price clauses or call for price filing. However, automotive manufacturers of equipment and accessories are affected along with the wide range of other industries, including the vast bulk of the total.

Coal interests, startled by the order, were the first to move against the order. The upshot is they were granted exemption from it last Saturday all along the line, from the producer through to and including the retailer. Coal apparently was held to be in an exceptional class by reason of competitive conditions faced in connection with other fuels. Many other protests have been and are being made against the order but with the President away from Washington they are being held in abeyance.

The President in announcing the order said it was intended to correct what he termed a very difficult situation in regard to the purchase of various articles by the Government. He explained that the Government is getting a series of identical bids on the plea of the bidders that they are precluded from putting in competitive bids by their filed prices with the respective code authorities.

The executive order provides that any bidder for a municipal, State or Federal Government contract or any other public authority, will be held to have complied with the code requirements, first, if he quotes a price to the government agency not more than 15 per cent below his filed price. Secondly, if he does quote a lower price, he shall file the lower price with the code authority. While the order itself does say so in so many words, the President himself stated that the public is thus given the advantage of the same reduction that the bidder offers to the Government.

Then if this lower price is made possible only by unfair practices, in the opinion of any member of a code authority, he has the right to complain to the administrator of the National Recovery Administration. The administrator is authorized to make a finding as to whether the complaint is justified or not. If he finds it necessary to prevent destructive price cutting he can reduce the "tolerance" of 15 per cent but "in no event to a tolerance of less than 5 per cent."

Disastrous Effects Feared

The price slash when bidding on government business, it is clear, could be made without advance notification to code authorities. Code provisions thus could be entirely ignored not alone by way of cutting prices but by way of giving no notice of such proposed action, without even filing the price until after it had been submitted and then it would be filed for the benefit of all buyers. Seeing this condition of price slashes, it has been pointed out that there would develop immediately a declining market and buyers do not ordinarily buy on a declining market. The effect on

business, industry and employment therefore, it is contended, would be disastrous. The purposes of codes to stabilize industry and increase employment and purchasing power would be given a staggering blow, halting rather than hastening recovery and striking at the very fundamentals of the NRA, with no purposes of codes left.

Making of identical bids on government business manifestly is a common practice. It applies to steel along with many other lines. Steel awards actually are made often by drawing bids in lots. It is not a practice that either the steel or other industries would care to spread to private commercial business. Nevertheless, identical bidding, it is pointed out, is specifically encouraged by the very nature of codes, built up by the government itself. While protests of government authorities against high prices often are held to be well justified, so far as known there has been no contention that steel, coal and many other products are unduly high in price. Earnings of producers assuredly do not indicate such a condition. The contrary is held to be much more nearly true.

Result of Attacks on Price Fixing

Protests however have also come from private as well as municipal, state and federal government purchasing agents against both identical bids and high prices and it is likely these protests were an important element in prompting the Presidential order. It is also true that reports from the Federal Trade Commission, the Consumers' Advisory Board of the NRA and the Darrow National Recovery Review Board against price fixing and high prices played a part in developing the order. There is serious doubt, however, that its potential and probably actual effects were given ample consideration. The remedy, it has been contended, lies in other means, such as specific action against specific articles or industries against which proven cases have been made.

The plea for the "little fellow," cries of "monopolistic practices," mounting protests from consumers generally against rising prices without proportionate rise in wages and purchasing power, however, are said to have been strong influences inspiring the order. Also whether correct or not there are reports that the White House reflects further retreat of NRA, a step that NRA itself was not prepared to take in such a precipitate manner. This move, so these reports have it, tend in the direction of greatly recasting the entire NRA set-up, recasting it to what many urge was the original intention. This, they say, would mean the setting up of codes of the simplest kind. They would provide for minimum wages, maximum hours, and establish working conditions under the terms of Section 7a, relating to the right of collective bargaining.

A Threat to NRA

Such a move, it is held, would take from many industries all interest in codes and therefore would threaten NRA, just as they say the sweeping executive order of last week threatens it unless it is modified. Nevertheless, others contend that with industries placed on identical bases as to wages, hours and working conditions, fair competition would be assured. Others take the view that such a simplification of codes would mean a return to the old days of destructive price cutting and mean a threat to industry generally.

The fact remains that when the recovery bill was before Congress its sponsors indicated the purpose was to set up codes of the simple type mentioned. One outstanding industry has such a code—the automotive industry.

Exit NLB; Enter NLRB With Broader Powers

WASHINGTON, July 3.—Set up under the Wagner substitute labor resolution, the new three-man impartial National Labor Relations Board, created by Presidential order last Saturday, means recasting of machinery for settling industrial disputes, with much broader power than that of the National Labor Board which was abolished. Heading the new board is Lloyd Garrison, native of New York City and acting dean of the Wisconsin Law School. The other two members are Harry Alvin Mills, native of Indiana, and professor of economics at the University of Chicago, and Edwin S. Smith, commissioner of labor and industries in Massachusetts for several years.

The board machinery does away entirely with the partisan character of the old board which was made up half of labor and half of industrial representatives with an impartial chairman. The new board is entirely of an impartial character just as is the temporary new National Steel Labor Relations Board, and reflects the desire of the administration to avoid disputes within the board memberships themselves as between labor and industrial interests. The new board is the central agency and will have power to conduct labor elections, hear cases of discharges and act as a voluntary arbitrator.

In announcing the new and permanent board, the President explained that it "is authorized to recommend to the President that in such cases as they deem it desirable, existing labor boards such as the industrial boards already created in the cotton textile industry or the petroleum industry, and such as the various regional labor boards should be re-established under the authority of the joint resolution . . . and also to recommend that additional boards of a similar character should be newly created."

The broad powers and flexibility of the board are readily seen from the President's statement, and it would indicate that he proposes not only to set up different boards, such as the steel labor board, for handling disputes in individual industries but that the regional board labor idea will be conducted but apparently to a lesser degree than prevailed under the old board. Likewise and perhaps most important is seemingly the plan to have each industry set up its own labor relations board wherever practicable, such as the cotton textile, petroleum and bituminous coal industries now have. This is a move toward greater self-government, toward letting industry and labor wash their own linen instead of packing it up and dragging it down to Washington and thus aiding in what they themselves so bitterly condemn—governmental bureaucracy. Industry and labor themselves are to blame for much of it.

That the President had this in mind possibly is seen in the course of his statement when he spoke as follows:

"Indeed, it is my hope that so far as possible adjustment in labor relations and the correction of labor abuses can be effectively made at the source of the dispute without bringing the parties before national authorities located in Washington.

"To accomplish this purpose and to eliminate other forms of confusion, it is provided that persons and agencies in the executive branch of the government shall not disturb the exclusive jurisdiction of the National Labor Relations Board and such other industrial, regional or special boards as I may, in accordance with the recommendations of the National board, designate or establish; and that all persons or agencies in the executive branch of the Government shall respect the findings and orders of such boards.

"This executive order, I believe, marks a great step forward in administrative efficiency and, more important, in governmental policy in

labor matters. It meets the universal demand not only of employers and employees, but of the public, that the machinery for adjusting labor relations should be clarified so that every person may know where to turn for adjustment of grievances."

Decisions Final

Secretary of Labor Frances Perkins predicted confusion as to jurisdiction in handling labor disputes would be ended by the establishing of the new board.

"The order," she said, "eliminates the duplication that might exist between the conciliation service of the Department of Labor and the new board by authorizing the conciliation service to handle individual mediation.

"When the new board takes jurisdiction of a case, not only are its findings final and not subject to review in the executive branch of the Government, but also its jurisdiction can not be disturbed by any person or other agencies in the executive branch of the government."

The President said that periodical reports from the new board "will be invaluable in the event that any permanent legislation is later contemplated and in developing a systematic knowledge of the general character of the labor relations problems in the United States of America, which must be justly and expeditiously handled."

Mr. Garrison is on a three-month leave of absence from his university work and will serve only temporarily with the new board. He is a graduate of Harvard Law School and a former assistant attorney general. During the World War he served in the navy.

Mr. Mills, prior to his association with the University of Chicago, was on the faculties of the University of Arkansas, Stanford University and the University of Kansas. He was a member of the United States Immigration Commission from 1908 to 1910; chairman of the board of arbitration in the men's clothing industry in Chicago from 1919 to 1923 and director of investigations for the Illinois State Health Insurance Commission in 1918-19.

Mr. Smith, Harvard graduate, class of 1915, is author of "Reducing Seasonal Unemployment."

Effective on May 31 the business of Railway Steel-Spring Co., a wholly owned subsidiary of American Locomotive Co. since 1926, was consolidated with the parent company and the business heretofore conducted by the Railway Steel-Spring Co. will hereafter be carried on by American Locomotive Co., Railway Steel-Spring Division, 30 Church Street, New York.

Urges Exclusion of Imported Manganese For Public Works

WASHINGTON, July 3.—Appeal has been made to President Roosevelt by President J. Carl Adkerson of the American Manganese Association to require use of domestic manganese in steel used on public works, to limit imports and to purchase and store domestic tonnage for the War Department for future emergency needs. With the recommendations went a petition from Mr. Adkerson signed by 41 Senators and 145 Representatives from 33 States recommending for the purposes of employment and for reasons of national defense "all just and proper actions that may be necessary to insure the maintenance and further development of the manganese mining industry in the United States." Attached to the petition is a letter under date of Jan. 19 addressed to Mr. Adkerson by Senator Walter F. George of Georgia urging that manganese ore "have greater protection for the benefit of both labor and capital involved in this country."

In his letter to the President, Mr. Adkerson declares that "the manganese mining industry offers an opportunity for immediate employment to labor unparalleled in other lines of the mining industry. From 5000 to 7000 men can be put to work in rural and mountainous areas difficult to reach through other lines of employment—and this can be done almost immediately."

He declares there is an abundance of manganese ore in southern and western States somewhat lower in grade than the market requires. He adds, however, that if customs mills for concentrating or beneficiating these ores are established in central points in manganese areas, operations can be started immediately and the product from the central mills will be higher in grade than imported ores. The present productive capacity of manganese mines and plants in the United States is estimated at 200,000 tons of manganese ore per year, valued at $5,000,000, delivered price, Mr. Adkerson says, and can be increased to take care of any normal increase in demands in the United States. It is stated that the present actual production of manganese ore in the United States is at the rate of 20,000 tons per year, valued at $500,000 delivered price, and employing 500 men. The only reason why there is not larger production and greater capacity of plants in the United States, Mr. Adkerson says, is on account of lack of fair competition in the domestic market. He places the normal consumption of manganese ore in the United States at approximately 700,000 tons per year (1926 to 1929). The consumption during 1932 and 1933 is estimated at 160,000 tons per year, while the present annual consumption is said to be at the rate of approximately 400,000 tons per year.

Mr. Adkerson quotes from Army Extension Courses, Industrial Mobilization Plans, prepared by the War Department, which says that "In spite of all handicaps, however, enough interest has been stimulated to result in the creation of a capacity much larger than indicated by annual domestic production (of domestic ore) and a readiness for expansion that is a decidedly important military asset."

The Tariff Commission is quoted as giving the average price of foreign manganese ore, delivered Pittsburgh area, during 1926 to 1929, inclusive, as 68.19c. per unit. Mr. Adkerson says American producers are prepared to deliver ores at average prices not exceeding this figure, and of an average grade higher than foreign ore.

He makes the following recommendations:

1. Enforcement of Title III of the Treasury-Post Office Appropriation Act so as to require domestic manganese in steel used on public works.

2. Prompt action toward limitation of manganese imports under Section 3 (e) of N.I.R.A., so as to allow proper operation of the code and further employment of labor.

3. Purchase and storage of domestic manganese ore by the War Department for future emergency needs.

Naval Vessels To Take 41,000 Tons of Steel

WASHINGTON, July 3.—Approximately 41,000 tons of plates and shapes will be required for the 24 vessels on which the Navy Department has asked for bids Aug. 15.

Estimates of the tonnages follow:

	Total	Plates	Shapes
Four cruisers	28,000	18,760	9,240
12 light destroyers....	9,600	7,200	2,400
Two heavy destroyers.	2,000	1,500	500
Six submarines	1,450	1,200	250
Total	41,050	28,660	12,390

One-half the number of each type of vessels will be built in private yards and the other half in the navy yards. The four cruisers are to be built with funds of the Naval Appropriation Act for 1935. Funds for the construction of the 20 smaller vessels are to be provided by the Public Works Administration. One of the cruisers is of the heavy type whose keel cannot be laid down until Jan. 1, 1935, under terms of the London Naval Treaty.

PWA Is Speeding Allotments Under Recent $750,000,000 Appropriation

WASHINGTON, July 3.—The Public Works Administration is moving quickly to make allotments under its new appropriation of $750,000,000. They are made up of projects that were on the "waiting list" when the original $3,300,000,000 appropriation for public works construction was exhausted in December.

Among projects included in the new lists are the following:

Stowe Township, Allegheny County, Pa., $319,000, loan and grant, for construction of reinforced concrete vehicular and pedestrian tunnel; cost of material, $265,000.

Fort Smith, Ark., $1,650,000, loan and grant, for development of gravity water supply, including earth dam on Poteau River, a 650-acre reservoir, a filter plant and a 1,000,000-gal. equalizing reservoir and supply main.

Greenwood County, S. C., $2,767,000, loan and grant, for construction of hydroelectric plant, comprising earthen dam across Saluda River, a 15,000-kw. generating system with necessary equipment and approximately 90 mi. of high and low tension distribution lines.

Wilkes-Barre, Pa., $300,000, loan and grant, for extension to sanitary and storm sewer system and construction of reinforced concrete highway bridge over Laurel Run Creek.

Hinsdale, N. H., $147,000, loan and grant, for construction of waterworks system, comprising impounding reservoir, intake and treatment plant, stand pipe and distribution system.

Columbus, Ohio, $1,618,000, loan and grant, for construction of system of storm sewers to serve 11 districts of city.

Wilkes-Barre, Pa., $350,000, loan and grant, for construction of two-story and basement fireproof annex to Court House.

Lincoln, R. I., $200,000, loan and grant, for construction of high school building with gymnasium and auditorium.

Denver, Colo., $469,000, loan and grant to City and County, for flood control project comprising construction of earthen dam with outlet pipe and spillway.

Michigan City, Ind., $435,000, loan and grant, for construction of approximately 11,200 lineal ft. of intercepting sewers and sewage disposal plant of activated sludge type.

Exeter, Pa., $215,000, loan and grant to Exeter township school district, for construction of two-story and basement, classroom, auditorium and gymnasium school building.

Cedarhurst, N. Y., $643,000, loan and grant, for construction of complete sanitary sewer system.

Elmsford, N. Y., $332,000, loan and grant, for construction of sanitary sewer collection system.

Hempstead, N. Y., $825,000, loan and grant, to Union Free School District No. 15, for construction of three-story, 27-classroom and gymnasium fireproof high school building at Lawrence, N. Y.

White Plains, N. Y., $255,000, loan and grant, for extensions to existing sewer system.

Johnson City, N. Y., $356,000, loan and grant, to Union Free School District No. 5, Broome County, for construction of three-story and basement fireproof school building.

Woodville, Pa., $2,100,000, loan and grant, to Allegheny County Home, for construction of hospital buildings.

Knoxville, Tenn., $406,000, loan and grant, for construction of junior high school building, an addition to Beaumont elementary school building and construction of grade school building.

Joliet, Ill., $1,790,000, loan and grant, for improvements to waterworks system, comprising a dam and impounding reservoir, water purification plant, supply main, arterial mains and 3,000,000-gal. stand pipe.

Camdenton, Mo., $666,000, loan and grant, for construction of concrete deck, steel truss toll bridge across Lake of Ozarks.

Trenton, Mo., $315,000, loan and grant, for construction of municipal electric plant, installation of two 500-kw. Diesel generating units and complete distribution system.

Rockingham County, N. C., $367,000, loan and grant, to Board of Education, for construction of six school buildings and alterations and additions to nine existing school buildings.

Green Bay, Wis., $822,000, loan and grant, to Green Bay Metropolitan Sewer District, Brown County, for construction of approximately 25,000 lineal ft. of intercepting sewer and completion and extension of sewage treatment plant.

New York, $2,020,000, loan and grant, for construction of two-story steel freight and passenger shed on existing concrete dock, together with dredging of two slips, sewer relocation and sidewalk construction at Pier 32, foot of Canal Street.

State of New York, $460,000, grant, to aid in grade crossing eliminations at eight streets in Port Richmond area of Staten Island, comprising elevation of tracks of Staten Island Rapid Transit Railway Co. for length of approximately 4000 ft., construction of bridges over Bodine Creek and necessary paving and sidewalk construction. Total cost of project, $1,724,000.

State of Missouri, $3,778,000, grant, to aid in improvements comprising construction, alterations and repairs to seven penal and seven eleemosynary institutions. Total cost, $13,244,000.

Jackson, Mich., $842,000, loan and grant, for construction of intercepting sewer and complete sewage disposal plant of activated sludge type.

Nassau County, N. Y., $500,000, loan and grant, to Union Free School District No. 6, town of North Hempstead, for construction of three-story fireproof Court House in Burgaw.

St. Louis, $720,000, grant, to aid in construction of complete system of relief sewers for Southern-Arsenal sewer district. Total cost of project, $2,490,637.

St. Louis, $332,300, grant, to aid in construction of 56 underpasses for pedestrian traffic. Total cost of project, $1,148,580.

State of New York, $385,000, grant, to aid in grade crossing eliminations in Tompkinsville and Stapleton, Borough of Richmond, Staten Island, at tracks of Staten Island Rapid Transit Railway Co., comprising depression of tracks and construction of reinforced concrete viaduct at Victory Boulevard, elevation of tracks and construction of underpasses at Wave, Prospect, Canal, Water and Thompson streets, including necessary appurtenances. Total cost, $1,524,000.

St. Louis, $347,000, grant, to aid in construction of fireproof armory building. Total cost, $1,235,000.

Elmira Heights, N. Y., $488,000, loan and grant, for construction of sanitary and storm water sewer system and sewage disposal plant.

Hempstead, N. Y., $291,000, loan and grant, to Union School District No. 17, for construction of two-story and part basement 17-classroom and combined auditorium-gymnasium school building.

Hudson, N. Y., $540,000, loan and grant, for construction of fireproof high school building.

Nassau County, N. Y., $295,000, loan and grant, to Union Free School District No. 19, town of Hempstead, for construction of three-story, 11-classroom, fireproof high school building in East Rockaway.

North Hempstead, N. Y., $440,000, loan and grant, to Union Free School District No. 7, town of North Hempstead, for construction of three-story and part basement addition to existing junior high and high school building in Great Neck.

Augusta, Me., $1,090,000 (Federal), to Veterans Administration for various construction projects at Veterans Administration Facility.

District of Columbia, $8,000,000, loan and grant, for construction of sewage disposal plant.

Las Animas, Colo., $555,000, loan and grant, to Bent Irrigation District for construction of storage reservoir, dam, outlet canal, tunnel and making repairs to existing canals and structures.

Aurora, Ill., $455,000, loan and grant, for use in drilling deep well, erection of elevated storage tank, construction of water reservoir and pumping station and extensions to existing water distributing system.

San Bernardino County, Cal., $350,000, loan and grant, to San Bernardino Valley Union Junior College District, for construction of auditorium, women's gymnasium and technical building.

Marion, Ind., $384,000, loan and grant, for construction of intercepting sewers, a lift station, river crossing, pumping station force main and sewage treatment plant of activated sludge type.

Petaluma, Cal., $325,000, loan and grant, for extension and separation of sanitary and storm sewers and construction of sewage treatment plant.

Russellville, Ky., $275,000, loan and grant, for construction of complete sanitary and storm-water sewage system with sewage disposal plant and outfall sewer and construction of water pumping plant on Red River, a filter unit, a supply main and extensions to existing water distribution system.

Jefferson Parish, La., $393,000, loan and grant to East Jefferson Water Works District No. 1, for extensions, improvements and repairs to existing waterworks system.

Menominee, Mich., $803,000, loan and grant, for construction of power house with four Diesel engine generators and necessary auxiliaries and controls, a complete distribution system and a combined garage and warehouse building.

Caddo Parish, La., $505,000, loan and grant, for road repairs and 15.71 miles drainage and miscellaneous culverts and four highway bridges.

Hillsboro, Mo., $275,000, loan and grant, to Jefferson County for construction of combined court house and jail.

St. Cloud, Minn., $1,229,000, loan and grant, to St. Cloud and Benton and Sherburne counties, for construction of steam electric generating station and complete electric distribution system.

Morehead City, N. C., $425,000, loan and grant, for development of terminal for ocean going vessels with necessary wharf, warehouses and facilities.

Greene County, N. Y., $400,000, loan and grant, to Central School District of towns of Hunter, Jewett and Lexington, for construction of two-story and part basement school building with auditorium and gymnasium in village of Tannersville, a two-story and part basement school building with auditorium and gymnasium in town of Hunter and a one-story and part basement school building with auditorium and gymnasium in town of Lexington.

Lake Mahopac, N. Y., $370,000, loan and grant, to Union Free School District No. 4, town of Carmel, for construction of two-story and part basement school building for accommodation of 560 pupils in village of Lake Mahopac.

Olean, N. Y., $815,000, loan and grant, to Union Free School District No. 1, Cattaraugus County, for construction of three-story and part basement fire-resisting high school building.

Deerfield, N. Y., $248,000, loan and grant, to Oneida County, for construction of three-story and basement fireproof hospital building, tunnel connecting with existing buildings, addition to existing septic tank, driveway and certain grading at Broadacre Sanatorium.

Schenectady, N. Y., $436,000, loan and grant, for construction of three-story and basement fireproof health center building adjacent to Ellis Hospital.

Buffalo, $582,000, loan and grant, for installation of approximately 9750 lineal feet of concrete storm sewer mains with all appurtenances to serve Michigan Avenue drainage district section.

Buffalo, $500,000, loan and grant, for construction of three-story and basement fireproof police headquarters building.

Elmira, N. Y., $313,000, loan and grant, for construction of relief storm sewers for north section of city comprising approximately 11,500 lineal feet of relief sewers, manholes, inlets and appurtenances.

Government to Make Study of Modernization of Railroad Equipment

WASHINGTON, July 3.—Modernization of freight and passenger equipment, involving study of metallurgical questions, such as the use of light and strong metals, constitutes the main theme of an inquiry under way by the coordinator's section of transportation service. To this end, Joseph B. Eastman, Federal Coordinator of Transportation, has appointed a mechanical advisory committee which will study reports on carolad and passenger traffic now in course of preparation. Consideration will be given to the question of whether present equipment and methods of operation are not only economical but well adapted to modern conditions and the needs of shippers and travelers.

In this inquiry, Mr. Eastman pointed out that important mechanical or metallurgical questions have arisen, of which he cited the following:

Use of new metals and alloys to reduce the excessive weight of equipment and the excessive maintenance necessary to avoid corrosion.

Use of non-harmonic springs, selective draft gears, high-speed brakes and wheels to avoid unnecessary shocks and damage to lading.

Use of all-purpose freight cars designed to handle any kind of freight and capable of being loaded or unloaded from any one of the six sides.

Use of cars which will run on the rail and highway interchangeably.

Use of containers designed for the needs of all sorts of commodities.

Use of truck bodies interchangeable between the chassis of a rail car and a highway truck.

Use of new forms of refrigerating devices.

Use of new-type steam, gasoline, Diesel, or electric locomotives, with varying types of transmission.

Committee Membership Named

The stage has now been reached where it is desirable to have special expert advice on such matters and the Coordinator has announced that the following mechanical authorities have agreed to serve without pay on a mechanical advisory committee which will cooperate with his section of transportation service:

L. K. Sillcox, vice-president, New York Air Brake Co., chairman F. W. Hankins, chief of motive power, Pennsylvania Railroad Co., Philadelphia; F. H. Hardin, assistant to president, New York Central Lines, New York; John Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe Railway Co., Chicago; C. J. Bodemer, superintendent of machinery, Louisville & Nashville Railroad, Lousville, Ky., and W. J. Patterson, director, Bureau of Safety, Interstate Commerce Commission.

The Coordinator's sections of purchases and car pooling will also be kept in close touch with the work of this advisory committee, because they, as well as the section of transportation service, have encountered these mechanical questions and have accumulated much data bearing on on them.

Aluminum Code Approved—Hearing On Steel Plate Fabricated Amendments

WASHINGTON, July 3.—Approval of the aluminum industry code by Administrator Hugh S. Johnson, for a trial period of 90 days, has been announced today. The order of approval is dated June 26. The code is effective July 11, but the order says ". . . in view of the objections which have been made to said code and which have received due and careful consideration, it is in the public interest . . . to put said code into effect for a period of 90 days, in order to determine the extent to which said code will aid to promote the policy and purposes of Title I of the National Industrial Recovery Act, with the pertinent provisions of which Act I find that said code complies. . . ."

"The Administrator will cause an investigation to be made during said 90-day period of the past practices of the industry and any modification of such practices or effect upon such practices resulting from the provisions of the code and a report made to the Administrator at least ten days prior to the expiration of said trial period, in order that he may determine the extent to which the code has operated to protect small enterprises from any alleged oppression or discrimination and has aided to effectuate the policy of said title of said act, and the administrator will request the aid of any other appropriate agencies of Government in the making of such investigation and report.

"During said 90-day period the Administrator will receive and investigate any complaints of unfair competition in the sale of fabricated products at prices constituting unfair competition, or oppressing small enterprises, or tending toward monopoly, or the impairment of code wages and working conditions."

Maximum hours are prescribed as 40 per week with a normal work day of eight hours, but there are various exceptions.

Object to Changes in Steel Plate Code

Strong opposition by representatives of the industry to any material change in the approved code of fair competition for steel plate fabricators was developed at a public hearing conducted by Deputy Administrator Walter G. Hooke, June 25.

The hearing was called to consider a number of amendments to the code, proposed by the Administration under the terms of its order of approval on April 6, and involving the following changes: (1) Extension of the code to cover all territory subject to the jurisdiction of the United States, except the Philippine Islands; (2) limiting the maximum workweek to a flat 40 hr., of five consecutive days and eight consecutive hours each, with permission for employer and employees to agree to a lesser number of days, not to exceed nine hours each, where it is necessary to work less than

40 hr. per week; (3) permission for overtime in cases of emergency, with all excess time to be paid for at the rate of time and one-half for shop work, and double time for all repair, renewal and construction or erection work; (4) prohibition against the employment of apprentices, except upon permission from the administrator; (5) increasing the minimum wage from 30c. to 35c. per hr. in Louisiana, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Florida and Mississippi; (6) abolishing the population differential for clerical employees and establishing a flat minimum wage of $15 per week for all workers except factory and construction employees and commission salespeople; and (7) inclusion of further safeguards for workers under the section of the code dealing with general labor provisions.

Merle Trees, president of the Chicago Bridge & Iron Works, and chairman of the code authority, voiced vigorous objection to the proposals for limiting apprentices and requiring bonus compensation for all overtime. He declared that the number of skilled workers now available for certain individual shops was limited, and that the imposition of overtime rates in many instances would work undue hardships.

Thomas Wyles, secretary of the code authority, supported the contentions of other witnesses that many of the proposals regarding labor conditions would not work out to the advantage of either employer or employee. He urged that provisions of the approved code be not amended until further experience had demonstrated an absolute need for some change.

Alloy Code Hearing Held

The proposed code of fair competition for the alloys industry was discussed at a hearing before Deputy Administrator Walter A. Janssen on June 25. Sponsored by the American Alloy Producers Association, the code was presented and read by John M. Price, the secretary. It provides for a 40-hr. week with peak or unusual demands to be met by averaging over six-week periods, no one week to be longer than 48 hr. and all time worked in excess of 40 hr. per week or 8 hr. per day to be paid for at the rate of time and one-third. A minimum hourly rate of 40c. in the North and 30c. in the South is established with provision made for paying a limited number of errand boys and girls and handicapped persons at the rate of 80 per cent of the minimum.

Construction Code Amendments Approved

Amendments to the code for the construction machinery distributing trade have been approved by Administrator Johnson and unless cause for suspension is shown in the meantime they will become effective July 8. Prior to the effective date any one may submit to Deputy Administrator Joseph Dilworth, room 4036 Department of Commerce Building, objections to the amendments.

Provision is made in the amendments for the election to the code authority of one additional member by members of the trade who warehouse, sell or distribute used machinery. There is also added to the code the provision making the payment of the cost of administering the code mandatory on members of the trade. It is provided that an itemized budget of the expenses and the method of contribution shall be submitted to the administrator for his approval. The budget has already been submitted and carries a total of $68,200 for the period from Feb. 5, 1934, to Dec. 31, 1934. This includes an estimated $30,000 for the expenses of 20 adjustment agencies during the period. The proposed basis of contribution is 0.3 per cent on the volume of sales for 1933. Objections to suggestions regarding the budget must be submitted to Deputy Dilworth prior to July 9.

Many changes in the trade practice provisions have been made, particularly those relating to the renting and sale of used and new machinery.

As amended the article on "publicity of prices" provides for the filing with the code authority 30 days after the amendments become effective, price lists and discount lists, if any, and a schedule of rental prices based upon units of time. It is also provided that members of the trade shall at all times keep the code authority informed of such prices and shall not alter them without filing notice of change. This information will be available for the inspection of all members of the trade and all other interested parties. Also copies of price lists and discount sheets will be furnished by the code authority to all who agree to pay their pro-rata share of the cost of the additional expense of circulation. This provision is made in accordance with the recently announced NRA price policy.

Refractories Trade Practice Committees

Acting Division Administrator Barton W. Murray has notified the code authority for the refractories industry that he had approved their plan as submitted for the administration of fair trade practice provisions as provided in the approved code, and that their trade practice committee is now empowered to handle all trade practice complaints arising under the code.

The members of the trade practice committee are: Roger A. Hitchins, president, American Refractories Institute, Philadelphia; A. P. Green, president, A. P. Green Fire Brick Co., Mexico, Mo.; F. L. Green, vice-president, General Refractories Co., Philadelphia; J. E. Lewis, president, Harbison-Walker Refractories Co., Pittsburgh; J. D. Ramsay, president, North American Refractories Co., Cleveland; H. L. Tredennick, president, Haws Refractories Co., Johnstown, Pa.; and J. Westphalen, vice-president, Laclede-Christy Clay Product Co., St. Louis.

Code Budgets Approved

A budget and schedule of contributions for the support of code administration for the gray iron foundry industry has been approved with an exception for the code authority from certain provisions of Executive Order X-36. The budget covering the period from Feb. 10 to Dec. 31, 1934, totals $107,923.40. Members of the industry will be required to contribute on a basis of 50c. per every $1,000 of gross sales per quarter. The exception to Executive Order X-36 permits the code authority to collect assessments from certain members of the industry whose chief products are not manufactured under this code.

Administrator Johnson has approved modifications to the approved codes for the fabricated metal products manufacturing and metal finishing and metal coating industry and for the gear manufacturing industry, as recommended by the code authorities. The amendments approved permit the code authorities for the two industries to submit proposed budgets and schedules of contributions, to the Administrator for his approval.

The code authority of the manganese industry has submitted for the Administrator's approval a budget of $1,100 for the period from June 15 to Sept. 15, 1934. It is proposed that this budget be financed by voluntary subscriptions on the basis of $100 per member. Criticisms, objections or suggestions must be submitted to Deputy Administrator W. A. Janssen, Room 3323, Department of Commerce Building, prior to July 9.

All criticisms concerning the proposed budget and schedule of contributions for the support of the code authority for the anti-friction bearing industry must be submitted in Room 4036, Department of Commerce Building, prior to July 9. The budget as proposed totals $50,000 for 1934 and is to be raised by contributions from members of the industry totaling one-tenth of 1 per cent of gross sales.

Objections to granting an exemption to the members of the fabricated metal products manufacturing and metal finishing and metal coating industry from Executive Order X-36 should be presented in Room 3084, Commerce Building, prior to July 7. Executive Order X-36 relieves an industry of the necessity of contributing to the support of any code administration except that of the code under which its principal products are manufactured.

Code Authorities Recognized

Administrator Johnson has approved the method of selection and recognized the personnel of the code authorities for the following industries:

Metal Etching Industry: E. C. Coolidge, Crowe Name Plate Co., Chicago; M. C. Jacober, Electro-Chemical Engraving Co., New York; O. C. Kuhrt, Chandler Co., Springfield, Mass; C. M. Owens, Etching Co., of America, Chicago, and H. D. Pope, Premier Metal Etching Co., Long Island City, N. Y.

Gear Manufacturing Industry: H. H. Kerr, North Quincy, Mass.; R. C. Ball, Philadelphia; Richard Ferguson, Gastonia, N. C.; Howard Dingle, Cleveland; F. H. Fowler, Chicago; Frank B. Drake, Berkeley, Cal., and, to represent nonmembers of the American Gear Manufacturers Association, Cutter P. Davis, Springville, N. Y., and as the latter's alternate, Rodney Davis, Philadelphia.

I. C. C. Cancels Increased Steel Rates in South

WASHINGTON, July 3—The Interstate Commerce Commission has refused to permit increased rates on iron and steel products, in carloads, from Memphis, Tenn., to points in northeastern Mississippi on the lines of the Gulf, Mobile & Northern and the St. Louis-San Francisco railroads. Protest against the proposed increases was made by the Memphis Freight Bureau. On Sept. 25, 1933, the carriers established a rate of 18c. per 100 lb. on wire, nails, spikes and roofing, from Memphis to about 20 stations in northeastern Mississippi to meet truck competition. The 18c. rate was originally published to ex-

pire Dec. 31, 1933, but the expiration date was extended. The carriers said truck competition is no longer compelling and proposed to restore the higher rates in effect for many years prior to Sept. 25, 1933. The suspended rates range from 27.8 to 32.8 per cent of the corresponding first-class rates as compared with 32.5 per cent approved for application on iron and steel articles in the southwestern and western trunk line territories.

Protestants contended that the suspended rates are not only unreasonable but that they would result in undue prejudice to shippers at Memphis and preference of competing industries at Birmingham. The commission pointed out that the southern carriers, including the respondents, have agreed upon a scale of distance rates, varying slightly from the southeastern scale, for uniform application throughout the South.

The commission also found not justified the proposed cancellation of rail-barge-rail commodity rates of 66c. and 65c., minimum 80,000 lb., to Dallas and Houston, Tex., respectively, on tin plate or terne plate from northern producing points over routes in connection with the Federal Barge Lines. The points of origin are Martins Ferry, Warren, and Yorkville, Ohio; Farrell, New Castle, Pittsburgh, and Washington, Pa.; Gary and Indiana Harbor, Ind., and Follansbee, and Weirton, W. Va. Numerous producers protested against the proposed cancellation of the rates.

Buffalo Mills Suspend Output Until July 5

BUFFALO, July 3.—The pig iron business has entered into its midsummer lull with no large inquiries being considered and very few small orders. Some iron, contracted for in the second quarter, but not shipped prior to June 30, has been cancelled.

After having reduced its active open-hearth operation from twelve to seven during the latter part of last week, Lackawanna plant of the Bethlehem Steel Corpn. shut down completely until July 5, at which time it will start with four active furnaces. Similar action was taken at the Republic Steel Corpn., South Buffalo plant; at the Wickwire-Spencer Steel Corpn., the American Radiator Co., and at the Seneca sheet division of the Bethlehem Steel Corpn.

The market for scrap is slow with hardly any transactions. Dealers are optimistic about buying during July, pointing out that mills have used their boat shipments of scrap for the past two months, without adding materially to stockpiles. A sale of 200 tons of No. 1 machinery cast at $10.50 is reported.

... PERSONALS ...

CASSIUS M. DAVIS, one of the assistant engineers of the transportation engineering department of the General Electric Co., at Erie, Pa., has been appointed engineer of the department, succeeding H. L. Andrews, who has been appointed a vice-president of the company. Mr. Davis first became identified with the General Electric Co. in 1909 in the test department. Four years later he entered the railway engineering department at Schenectady and in 1929 was made assistant engineer of that division, the name of which had meanwhile been changed to the transportation engineering department. He moved with the department to Erie in 1929. W. C. Harris, another assistant engineer of the same division, will continue in that position, acting in addition in general charge of the department in the absence of Mr. Davis.

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JOHN ARMS, industrial engineer and a member of the firm of Arms & Madeheim, New York, has been elected secretary of United Engineering Trustees, Inc., to succeed ALFRED D. FLINN, who has resigned. Mr. Arms has been general manager of the corporation since Dec. 9, 1933, and will continue to be, combining the duties of both offices. In his new office he will be the chief administrative officer for the Board of Trustees in caring for the Engineering Societies Building, New York, the Engineering Societies Library, and endowment funds which the corporation holds for the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, jointly. He received his M.A. degree from Cornell University in 1907.

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R. H. DANFORTH, for 20 years professor of mechanics and materials at the Case School of Applied Science, Cleveland, has been made administration member of the code authority for the drop forging industry.

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WILBERT J. AUSTIN, president, the Austin Co., Cleveland, sailed a few days ago for Russia, where he will take part in a tour under the direction of the American-Russian Chamber of Commerce. He expects to be gone several months and may visit Siberia and China before his return.

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ISAAC M. SCOTT, of Pittsburgh, and Garrett B. LeVan, of Steubenville, Ohio, have been appointed ancillary receivers of the Follansbee Brothers Co. by the Federal District Court at Columbus, Ohio.

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E. A. DARLING, vice-president, International Selling Corpn., New York, is sailing July 5 for a several weeks' trip through Europe. He will visit France, Spain, Germany and Belgium.

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CHARLES P. WOOD, since 1920 associated with Lockwood Green Engineers, Inc., has been named administration member for the code authority of the railroad cars building industry. A graduate of Cornell, Mr. Wood from 1908 to 1917 was engaged in mechanical and electrical engineering and sales work with Ridgeway Dynamo & Engine Co., Atlanta, Ga., Standard Gas Power Corpn., Boston, Empire Floor & Wall Tile Co., New York, and Lewis A. Riely, consulting engineer, New Jersey. From 1917 to 1918 he served with the U. S. Engineers as a major and from 1919 to 1920 he was trade commissioner in France and Belgium for the United States Bureau of Foreign and Domestic Commerce.

Steel Industry Payrolls Increase by $6,424,053

PAYROLLS in the steel industry in May reached a new post-depression high of $51,895,931, an increase of $6,424,053 over April, according to figures announced by the American Iron and Steel Institute. At the same time, it was revealed that 18,276 more people were employed during the month, bringing the total number of employees up to 449,362.

The number of wage earners increased 17,629 during the month to 409,698. This is slightly more than 97 per cent of the total employed at the 1929 peak and is 104,459 more than were working a year ago. Total wages for this group increased during May by 16.6 per cent to $42,916,172.

The average hourly wage per worker in May was 64.6c. compared with 47.3c. in June, 1933. The average hr. per week for each wage earner during May was 36.6 compared with 33.7 in April and 39.4 in June last year.

Average hours per week for all employees, including those on salary, was 37.1 and the average hourly wage rate was 70.3c., making an average weekly income for all employees of $26.08. Total hours worked by wage earners increased from 56,723,813 in April to 66,450,593 in May. During the same period the industry's operating rate increased from 54.19 per cent of capacity to 58.06 per cent.

... OBITUARY ...

LLEWELLYN W. JONES, founder and president of the Manganese Steel Forge Co. and president of the Audubon Wire Cloth Corpn., Philadelphia, died at his home, Rosemont, Pa., June 24, in his 72nd year, after a two-year illness.

He was born in Philadelphia, attending private schools and graduated from Dr. Faries School in 1880. From 1880 to 1882 he was an apprentice at Wm. B. Bement & Sons, machine tool builders, where he assisted in building the first large gun lathe for the U. S. Government Arsenal, Watertown, N. Y. He then entered a three-year course of instruction in locomotive and car building at the Altoona Shops, Pennsylvania Railroad, following which he served four years in various departments.

He resigned in 1889 to become president and general manager of the Philadelphia Drop Forge Co., where he served six years.

From 1895 to 1898 he was successively superintendent, general superintendent, engineer of construction and purchasing agent of the Schoen Pressed Steel Co., Pittsburgh, Pa. As superintendent, he built the first commercial pressed steel cars manufactured in the United States and designed the equipment for their production. As engineer of construction, he built the Allegheny Shops of this company, which employed 2000 men.

From 1898 to 1901 he was purchasing agent and assistant to the president of the Pressed Steel Car Co., successor of the Schoen Pressed Steel Co. He purchased all buildings and equipment for the McKees Rocks plant, which, with the Allegheny plant, then employed 6000 men.

From 1901 to 1906 he was president of the M. B. Suydam Paint Co., where he designed and installed a modern plant for the manufacture of paint.

From 1906 to 1910, as president of the Pittsburgh Filter Co., he designed and erected many municipal and private filtration plants, in connection with which he is credited with many inventions and improvements.

From 1910 to 1912 he was general manager of the Cyclops Foundry Co., where he made the first manganese steel pipe ball to be manufactured in the United States and now in general use.

In 1912 he removed to High Bridge, N. J., where he became works manager of the Taylor Iron & Steel Co. In 1913 and 1914 he was made vice-president in charge of manufacture of the six plants of the Taylor-Wharton Iron & Steel Co., a consolidation of the Taylor Iron & Steel Co., High Bridge, N. J.; Wm. Wharton, Jr., & Co., Philadelphia and Jenkintown; Manganese Steel Safe Co., Plainfield, N. J., and Tioga Steel & Iron Co., Philadelphia. He resigned in 1914 to become eastern manager of the Alloy Steel Forging Co., Carnegie, Pa., manufacturers of manganese and alloy steel forgings. When the Government took over this plant during the war, Mr. Jones formed the Alloy Steel & Metals Co., operating an iron and steel commission business until 1921, when he founded the Manganese Steel Forge Co. To him are due the mechanical and commercial developments of rolled and forged manganese steel that made it available to a wide range of industry. He produced the first drawn manganese steel wire, now generally used in wire cloth and in the electric industry. He also introduced rolled and forged manganese steel as wear plates and forgings to the street and steam railway industry.

Mr. Jones was a member of the Engineers' Club, Philadelphia, and kindred organizations.

J. C. GRIFFIN

H. L. McCAULEY

He is survived by his widow, a son, Llewellyn W., Jr., and two daughters, Miss Adelaide and Miss Constance A. Jones.

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J. C. GRIFFIN, president of the Griffin Mfg. Co., Erie, Pa., died June 20, at his home in that city. He was born at West Norwalk, Conn., and later moved to Pittsburgh and from there to Erie, Pa. For more than 35 years he was president of the concern of which he was one of the founders.

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HARRY L. MCCAULEY, district sales manager at Milwaukee for the Inland Steel Co., died in that city on June 26. Mr. McCauley had operating experience in the sheet mills of the American Sheet & Tin Plate Co. at Gary and in May, 1920, became affiliated with the Inland company in its order department at Chicago. On May 1, 1924, he was transferred to the Milwaukee office as assistant district sales manager and on March 1, 1928, was promoted to district sales manager. He was 44 years old.

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JOHN CARY SPRING, a former partner in the Laconia Car Co., Laconia, N. H., died at his summer home in Gloucester, Mass., on June 29. He was born in Somerville, Mass., 64 years ago. He retired from active business some 15 years ago.

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HARRY W. TUEMLER, in charge of sales for the Newport Rolling Mill, Newport, Ky., died on June 28 at his home at Covington, Ky., aged 51 years. He had been connected with the mill for 32 years.

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FRANK G. CUTLER, chief engineer of the bureau of steam engineering of the Tennessee Coal, Iron & Railroad Co., died June 17 in New York. He had been connected with industrial operations in Birmingham for 28 years.

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ROBERT MONTEITH, SR., long identified with the pressed steel products industry at Milwaukee, died June 19, aged 61 years. He was one of the founders of the former Seamless Steel Products Co. During the war he managed a munitions factory in Chicago.

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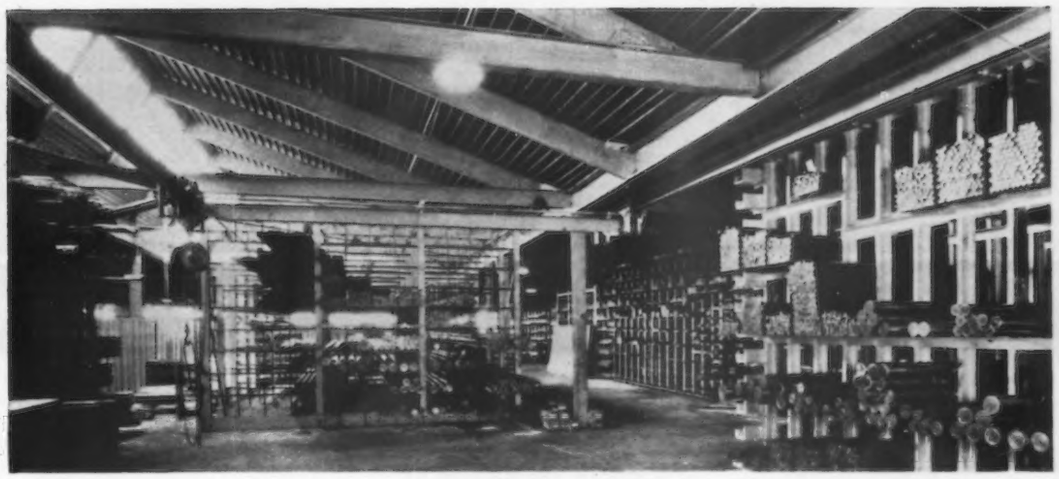
JAMES T. GREEN, tool steel sales representative for the Bethlehem Steel Co., with headquarters at Chicago, was killed in an automobile accident near Huntington, Ind, June 29.



Ryerson Completes Large Extension at St. Louis

THE new addition to the Ryerson plant and equipment, at St. Louis, greatly increases facilities for storing and dispatching steel and allied products for the St. Louis area.

Approximately 40,000 sq. ft. of floor space has been added by extending one of the large spans 165 ft. and erecting a new building across the east end of the main warehouses. The greater part of this new space is given over to the warehousing of products requiring special protection from atmospheric changes. A circulating warm air heating system provides the necessary distribution of heat for the proper storing of sheets, tool steels, welding rod, cold finished bars, bands, hoops and other high grade steels. Particular attention has always been given to warehousing this product to prevent any possibility of the slightest condensation of atmospheric moisture spoiling the quality and finish of the many special highly finished grades carried in stock. The new heated area for this protection of products, is almost three times larger than the old heated plant space.

On the second floor of the new building are modern daylight offices equipped with an air-conditioning and cooling system.

While the greater proportion of this new addition is heated, there is also a large span for mild steel bars, etc.; for cutting, shearing, loading and other general steel-service.

Unusual truck loading facilities are provided. Motor trucks back into a recessed pit in the new span, bringing the floor of the truck level with the floor of the building and thus simplifying the shipping of material. One new crane has been placed in operation and another crane and run-way has been extended through the new building. The new spans are also served by railroad spurs for inside loading and unloading of products.

Stocks are being increased. Many new products and sizes will be added, making immediately available to the St. Louis area the largest and most diversified stocks of steel and allied products.

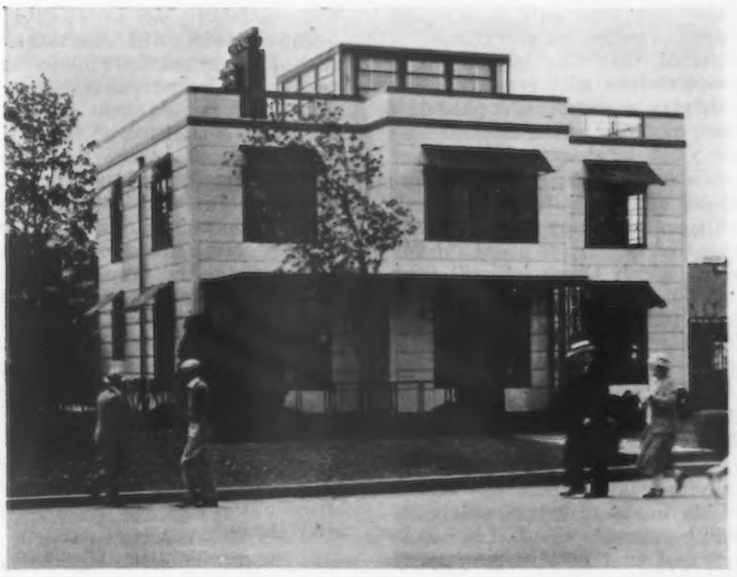
Other Ryerson plants are located at Chicago, Milwaukee, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

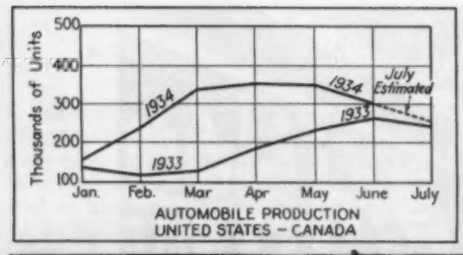
Porcelain Houses Change Color

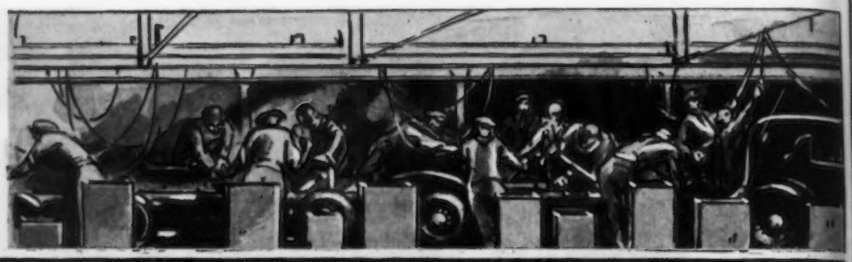
WHEN those living in a house with a porcelain enamel exterior get tired of the appearance of the house, all they have to do is to slide out flat panels of porcelain enamel, which are held in place with a groove clip strip of stainless steel, and put in new panels of a different color and different characteristics.

This is actually what was done to the porcelain enamel frameless steel house at the Chicago World's Fair when it was desired to change its appearance for this year's visitors. The man in charge of the work said: "Changing the exterior merely involved slipping the old porcelain enamel metal out of the clips and inserting the new."

This house was built for the American Rolling Mill Co., Middletown, Ohio, and the Ferro Enamel Corpn., Cleveland, by the Insulated Steel Construction Co., Middletown, Ohio. It was constructed of specially formed sheets of steel which were factory fabricated into house-high wall sections. These sections were then joined in the field with special screws.







THIS WEEK ON THE

Auto Makers Press for Steel Price Reductions

DETROIT, July 3.

WITH many automobile and parts manufacturing plants closed all of this week, July is getting off to a poor start. Since the Fourth of July holiday broke the week into two short working parts, the industry regarded this as an ideal time to shut down. The industry's largest single unit, Ford's Rouge plant, is idle. Ford asked all suppliers to suspend shipments of materials and parts from June 28 to July 9. Hudson Motor Car Co. is closed, as is the Murray Corpn., Bower Roller Bearing, Gemmer Mfg. Co. and General Spring & Bumper, as well as a number of other companies catering to the automotive trade.

This unimpressive get-away, however, should not be allowed to convey the false idea that July is bringing a collapse in motor car operations. It is expected that the industry will resume activities with renewed vigor next Monday, maintaining a pace during the remainder of the month which should yield total assemblies of at least 275,000 units, and perhaps nearer 285,000 units. The tentative schedules of General Motors divisions alone are reported to call for about 115,000 units, of which Chevrolet will turn out 90,000. This represents an increase of 16,000 units over Chevrolet's original plans.

August, of course, will bring a further recession in production, but not of alarming proportions. It is impossible at this time to predict what the fall months have in store for the industry, but lately there has been a noticeable improvement in sentiment regarding prospects then. The industry's output in the third quarter of 1933 was 684,089 passenger cars and trucks. The possibility is considered fair that this figure may be equaled in July, August and September of this year.

New Car Introductions Postponed

Events are shaping up so that the introduction of 1935 cars is being pushed farther into the background. Manufacturers are watching each other closely in order to gain any advantage possible in the present competitive struggle. Early fall announcements seem to have given way to the idea of carrying through for some time with current models, relying for sales volume on large advertising expenditures and intensive merchandising. With one or two notable exceptions, it appears that next year's cars will not be ready before November and December.

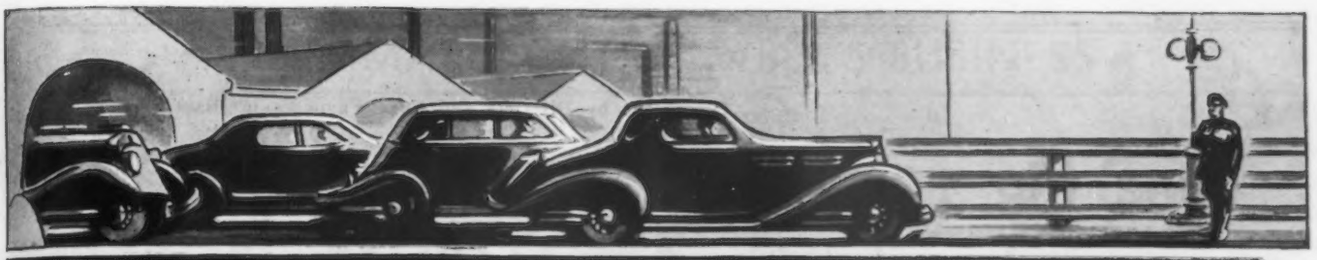
One reason why manufacturers don't know what their plans will be is that the industry has not yet decided what to do about 1935 shows. The show committee of the National Automobile Chamber of Commerce met in Detroit on June 28 to make recommendations which will be passed on finally by the board of directors on July 11. Not until the latter date, at least, will the industry know whether its national shows are to be continued or whether local shows are to be held simultaneously in 100 cities throughout the country, possibly in February. Upon this decision depends to some extent the future plans of individual makers. Sentiment among both dealers and manufacturers seems to be evenly divided between continuation of national shows and substitution of local shows.

In the consideration of changes for 1935, one rule has been laid down which will be rigidly adhered to by practically all manufacturers. Changes in materials and designs will be made provided that the cost of production is not increased. No material, such as stainless steel, has a chance to replace other materials unless it can be proved beyond doubt that the final cost of the part will be no more or possibly less than the present cost.

Makers Trying to Reduce Costs

Manufacturers still are keenly conscious of the fact that they burned their fingers a few months ago when they raised prices to levels higher than the public would willingly pay. It is believed that they do not care to repeat this experience when next year's models are announced, consequently it will be surprising if retail automobile prices at the beginning of 1935 will be higher than they are today. However, the cost of making cars today is greater than the production expense in 1933, and managements of motor car companies are using every device to reduce today's outlay per unit.

This accounts for the pressure which car makers have brought to bear on parts suppliers for lower prices, and finally on steel mills, resulting in the filing of lower quotations on bars, strip steel and some grades of sheets. The automobile industry has been unalterably opposed to certain provisions in the steel code, particularly those relating to prices. High purchasing officials have asserted that a few large steel companies, which controlled the decisions of the Code Authority, were holding an umbrella over the smaller mills and over those who were not in a position to



ASSEMBLY LINE

survive under severe competitive conditions.

Automotive steel buyers have voiced strenuous objections constantly to the necessity of paying a base price at Pittsburgh or at some other steel producing point for steel made in the Detroit district. To demonstrate their disapproval of this policy on the part of the steel industry, some of the companies went so far as to reduce the proportion of their tonnage formerly placed with large mills and distribute the bulk of their business among the smaller mills.

Large Buyers Want Detroit Base

It is no secret that steel mills in this immediate district have been under special fire because of their proximity to the plants of automobile companies. What the large motor car manufacturers have as their aim is establishment of Detroit as a basing point on all steel products made here, and they will not be satisfied until they succeed.

The steel trade agrees generally that the reduction of prices will not expand by a single ton the amount of steel to be used by the automobile industry during the third quarter. With steel mills heading into a season of relatively low demand, when they will consider themselves fortunate to be able to break even, the new prices will make increasingly difficult the task of conducting their operations without entailing a loss.

What the automobile industry still hopes to secure is a preferential price for large steel users instead of the present one-price policy. Detroit steel buyers point with approval to the provision in the code for the bolt and nut industry which exempts producers from regulating prices made to customers using a specified volume for each quarter. They would like to have something similar in connection with steel prices.

The filing of lower prices on steel items consumed in large quantities at Detroit is certain to result in a redoubling of efforts by motor car companies to obtain other concessions, either in the form of further decreases or modifications in the steel code, or both.

That automobile steel buyers did not gamble on possible declines in steel prices is shown by the stocks which were laid in prior to July 1. In many cases the tonnage stored is enough to carry through to the end of present production runs. On the other hand, some car makers were rather indifferent about expanding steel stocks beyond normal size and seemed to feel that the original prices announced for third quarter might not hold.

By BURNHAM FINNEY
Detroit Editor, THE IRON AGE

The automobile industry is not expected to make sizable purchases of steel until about the middle of August. On the other hand, orders for small tonnages have been placed by motor car companies at third quarter prices, and the total amount of steel specified in the next six weeks may be larger than anticipated.

Pig iron shipments to automotive foundries during June were the largest for a single month since 1929, running ahead of those in December 1933. Jobbing foundries specializing in automotive dies have secured a few orders from body builders, but the bulk of the 1935 die work has not yet been placed.

One of the problems on which car makers now are concentrating their attention is what to do about so-called knee action. In certain cases the fact is evident that the cost of making the unit today is too high, not to mention the difficulty experienced in whipping the manufacturing intricacies involved. Two car makers have equipped experimental cars with the independent springing system designed by members of the Leaf Spring Institute. Is is safe to say that independent springing, in one form or another, is here to stay, and few cars in 1935 will be without it. It may be extended to rear wheels by some companies.

Tooling programs for next year are being perfected slowly. The machine tool trade is losing hope that much equipment will be bought before Aug. 1 or possibly Aug. 15. It is understood that the Chrysler divisions will not be ready to buy any machinery for 1935 cars for at least 30 more days. Packard, which is said to have been debating the advisability of purchasing new equipment for its light eight, may spend as much as a million dollars, although no definite decision has been reached.

While retail sales of automobiles are tapering, total retail deliveries in June are estimated at approximately the same valume as in May. Chevrolet, with reports from dealers showing sales in the first 20 days of June far ahead of those in the corresponding period of May, is believed to have finished the month with a comfortable lead over the previous month.

Oldsmobile states that its retail sales up to June 20 this year were almost double those for the same period last year. Its production schedule for July shows a gain over June. Dodge dealers this year have sold 94,917 Dodge and Plymouth passenger cars and 21,356 trucks. In the 24 weeks of this year, including June 16, Chrysler dealers made deliveries of 64,738 Plymouths, Chrysler sixes and Chrysler Airflows.

Packard is understood to have decided to abandon the building of its own bodies for 1935 cars. Briggs Mfg. Co. is said to have been awarded a contract for manufacture of all the bodies for the proposed Packard light eight. Briggs also may produce some of the series of larger Packard cars.

Possible mergers of independent automobile companies is a subject of interest in Detroit at the moment. The main purpose in any merger would be to bring together car makers in two price fields thereby augmenting the lines which dealers will have to sell. The latest story is that Hudson and Packard are talking about a consolidation.

Reports published recently to the effect that Pontiac will abandon its eight next year in favor of a six are unfounded. Pontaic will have both a six and an eight in 1935. Chrysler Corpn. will make about 45,000 cars in July of which 40,000 will be turned out by the Plymouth and Dodge Divisions. Studebaker is reported to have shipped about 5400 units last month.

June Pig Iron Output Off 2.4 Per Cent

Production by Districts and Coke Furnaces in Blast

Furnaces	Production (Gross Tons) June (30 Days)	Production (Gross Tons) May 31 Days	July 1 Number in Blast	July 1 Operating Rate, Tons a Day	June 1 Number in Blast	June 1 Operating Rate, Tons a Day
New York:						
Buffalo	112,871	129,968	5	2,920	7	4,195
Other New York & Mass.	18,627	5,450	2	620	2*	625*
Pennsylvania:						
Lehigh Valley	32,555	35,456	3	1,120	3	1,145
Schuylkill Valley	22,157	22,632	2	740	2	730
Susquehanna and Lebanon Valleys	17,177	17,732	1	575	1	570
Ferromanganese	....	....	0	....	0	....
Pittsburgh District	406,674	426,040	13	8,295	21	13,710
Ferro. and Spiegel	4,083	4,358	1	135	1	140
Shenango Valley	31,891	33,384	1	595	2	1,075
Western Pennsylvania	34,989	67,329	1	405	4	2,170
Ferro. and Spiegel	6,014	5,643	1	200	1	180
Maryland	80,887	90,475	3	2,055	4	3,120
Wheeling District	125,229	124,961	5	2,930	7	4,030
Ohio:						
Mahoning Valley	198,206	212,809	6	4,105	10	7,040
Central and Northern	225,636	252,565	12	6,160	14	8,145
Southern	39,251	30,940	3	1,215	4	1,160
Illinois and Indiana	343,341	365,946	12	8,490	16	11,805
Mich. and Minn.	58,364	52,974	4	1,945	4	2,160
Colo., Mo. and Utah	19,828	21,133	2	660	2	680
The South:						
Virginia	....	....	0	....	0	....
Kentucky	22,470	11,395	2	750	1	370
Alabama	128,183	130,364	10	4,275	10	4,205
Ferromanganese	....	....	0	....	0	....
Tennessee	1,700	1,342	0	....	1	45
Total	1,930,133	2,042,896	89	....	117	67,300

*Revised. The Port Henry furnace of the Troy Furnace Corpn. was put in operation in May.

PRODUCTION of coke pig iron in June totaled 1,930,133 gross tons, compared with 2,042,896 tons in May. The daily rate in June, at 64,338 tons, showed a loss of 2.4 per cent from the May rate of 65,900 tons a day. Production for the first six months this year, at 9,798,313 tons, compares with 4,441,003 in the corresponding period last year.

There were 89 furnaces in blast on July 1, making iron at the rate of 48,190 tons a day, compared with 117 furnaces on June 1, operating at the rate of 67,300 tons a day. Twenty-nine furnaces were blown out or banked during June and one furnace was blown in. The Steel Corporation blew out or banked 14, independent steel companies blew out or banked 12, and merchant producers, three.

Among the furnaces blown out or banked are the following: One Lackawanna, three Cambria, and one Sparrows Point, of the Bethlehem Steel Co.; one Donner, one Haselton, one Trumbull-Cliffs, Republic Steel Corpn.; two Aliquippa and one Eliza, Jones & Laughlin Steel Corpn.; one Shenango, Shenango Furnace Co.; one Campbell, Youngstown Sheet & Tube Co., one Clairton, two Duquesne, two Mingo and one Ohio, of the Carnegie Steel Co.; two Monongahela and two Lorain, of the National Tube Co.; two South Chicago and two Gary furnaces, of the Illinois Steel Co.; one Jisco, of the Jackson Iron & Steel Co., and one Rockdale, of the Tennessee Products Corpn.

The Norton furnace of the American Rolling Mill Co. was the only one blown in in June.

Daily Average Production of Coke Pig Iron

Gross Tons

	1934	1933	1932	1931
January	39,201	18,348	31,380	55,299
February	45,131	19,798	33,251	60,950
March	52,243	17,484	31,201	65,556
April	57,561	20,787	28,430	67,317
May	65,900	28,621	25,276	64,325
June	64,338	42,166	20,935	54,621
½ year	54,134	24,536	28,412	61,356
July	.....	57,821	18,461	47,201
August	.....	59,142	17,115	41,308
September	.....	50,742	19,753	38,964
October	.....	43,754	20,800	37,848
November	.....	36,174	21,042	36,782
December	.....	38,131	17,615	31,625
Year	.....	36,199	23,733	50,069

Production of Coke Pig Iron and Ferromanganese

Gross Tons

	Pig Iron* 1934	Pig Iron* 1933	Ferromanganese† 1934	Ferromanganese† 1933
January	1,215,226	568,785	11,703	8,810
February	1,263,673	554,330	10,818	8,591
March	1,619,534	542,011	17,605	4,783
April	1,726,851	623,618	15,418	5,857
May	2,042,896	887,252	10,001	5,948
June	1,930,133	1,265,007	10,097	13,074
½ year	9,798,313	4,441,003	75,642	47,063
July	.....	1,792,452	.....	18,661
August	.....	1,833,394	.....	16,953
September	.....	1,522,257	.....	13,339
October	.....	1,356,361	.....	16,943
November	.....	1,085,239	.....	14,524
December	.....	1,182,079	.....	9,369
Year	.....	13,212,785	.....	136,352

*These totals do not include charcoal pig iron. The 1932 production of this iron was 15,055 gross tons.
†Included in pig iron figures.

Steel Production Drops to 21 Per Cent As Prices Are Reduced

New Quotations Are Still $1 to $5 a Ton Above Levels Applicable to Business in First Half—Presidential Order Threatens Price Stability Under Code

PRICE reductions on many important steel products, a drop in ingot production to 21 per cent of capacity and the issuance of a Presidential order which threatens price stability under the code were this week's outstanding developments in the iron and steel industry. While all three are significant, the sharp decline in production had been anticipated because of the mid-week holiday and the completion last week of second quarter commitments.

Independence Day is one of the year's two official holidays in the steel industry, and even though ingot output is figured on a five-day basis, the week's rate averages only 21 per cent, as compared with 48 per cent last week and 60 per cent in the week before. Many large plants have entirely suspended operations, and others are closing down either in the first two or last three working days of the week.

Schedules in the Pittsburgh, Youngstown and Buffalo districts average only 10 per cent of capacity, while the Cleveland and Philadelphia territories are running at 15 and 19 per cent respectively. The rate at Chicago dropped from 52 to 28 per cent, while a semblance of normal production is being maintained only at Detroit, Birmingham and Wheeling where the scheduled rates are 100, 50 and 40 per cent respectively. In all districts the extent of recovery next week will be measured by actual consumer requirements and throw some light on probable summer activity in the industry.

RECENT sharp curtailment in steel output has been accompanied by a drastic decline in pig iron production, 29 blast furnaces having been blown out or banked in June, while only one blew in. On July 1 iron was being made at a rate of 48,190 tons daily, as compared with 67,300 tons on June 1. June production of 1,930,133 tons was only slightly less than the 2,042,896 tons made in May, while the June daily average rate declined only 2.4 per cent from 65,900 tons to 64,338 tons.

THE Presidential order issued June 29, which permits a bidder on Federal, State or municipal projects to reduce prices up to 15 per cent from those regularly filed with his code authority would seem to nullify all price stabilization achieved under NRA codes. The order further provides that any price filed on such a contract must then become the official minimum price on file with a code authority and be extended to the trade generally. The process might be repeated indefinitely with obvious results. The steel code authority will seek exemption from the order on the grounds that the code constitutes a contract which cannot be abrogated except by mutual consent of all concerned. Exemption has already been granted the coal industry.

THE price reductions of $1 to $4 a ton on many finished steel products which have been filed in the last few days can scarcely be considered as definite declines. They actually amount to the paring down of the increases announced early in the second quarter. Those mark-ups, amounting to as much as $8 a ton, were considered rather drastic even by some producers, and scarcely any tonnage was shipped at the higher levels. The new prices represent increases of $1 to $5 a ton over the figures at which steel moved in the first half of the year. They more than offset the increased costs brought about by wage increases and other expenses under the steel code. Although these quotations would not be profitable with operations at the current level, they would certainly yield an adequate return if production again approached the average of the second quarter.

Steel bars have been marked down $2 a ton to 1.80c., Pittsburgh, and plates and shapes $1 a ton to the same level. All had been marked up $3 a ton early in the second quarter. Hot-rolled annealed sheets are reduced $4 a ton to 2.45c., Pittsburgh, but had previously been advanced $8. Hot-rolled sheets, reduced $3, had been advanced $5; galvanized sheets, reduced $3 after an advance of $8; light cold-rolled sheets, reduced $4 after an $8 mark-up; hot-rolled strip, reduced $3 after a $5 advance; cold-rolled strip, reduced $4 after an $8 advance; alloy steel bars, reduced $2 after a $2 advance; sheet bars, reduced $2 after a $4 advance, and billets, slabs and blooms, reduced $2 after a $3 increase. When the new prices already filed are effective next week, THE IRON AGE composite price will be reduced from 2.199c. a lb. to 2.131c. a lb., or $1.37 a ton, after having been advanced $3.82 a ton in the last week of April, the net gain being $2.45 a ton.

Public works projects have been increased by the rapid allotment of a large part of the $750,000,000 recently appropriated by Congress for that purpose. Many of these jobs will be ready for bids before the end of the summer. The Navy Department will take bids Aug. 15 on 24 vessels which will require 41,000 tons of plates and shapes. Structural awards in the past week amounted to 10,550 tons, compared with 8700 tons last week. New inquiries call for only 8950 tons, compared with 26,750 tons in the preceding week.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	July 3, 1934	June 26, 1934	June 5, 1934	July 5, 1933
Per Gross Ton:				
No. 2 fdy., Philadelphia	$20.26	$20.26	$20.26	$16.34
No. 2, Valley furnace	18.50	18.50	18.50	15.50
No. 2 Southern, Cin'ti	19.13	19.13	19.13	16.51
No. 2, Birmingham†	14.50	14.50	14.50	12.00
No. 2 foundry, Chicago*	18.50	18.50	18.50	16.00
Basic, del'd eastern Pa	19.76	19.76	19.76	16.09
Basic, Valley furnace	18.00	18.00	18.00	15.00
Valley Bessemer, del'd P'gh.	20.76	20.76	20.76	17.89
Malleable, Chicago*	18.50	18.50	18.50	16.00
Malleable, Valley	18.50	18.50	18.50	15.50
L. S. charcoal, Chicago	24.04	24.04	24.04	23.17
Ferromanganese, seab'd carlots	85.00	85.00	85.00	82.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.

*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$40.00
Light rails, Pittsburgh	35.00	35.00	35.00	30.00
Rerolling billets, Pittsburgh	29.00	29.00	29.00	26.00
Sheet bars, Pittsburgh	30.00	30.00	30.00	26.00
Slabs, Pittsburgh	29.00	29.00	29.00	26.00
Forging billets, Pittsburgh	34.00	34.00	34.00	31.00
Wire rods, Pittsburgh	38.00	38.00	38.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.60

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.90	1.90	1.90	1.60
Bars, Chicago	1.95	1.95	1.95	1.70
Bars, Cleveland	1.95	1.95	1.95	1.65
Bars, New York	2.23	2.23	2.23	1.95
Plates, Pittsburgh	1.85	1.85	1.85	1.60
Plates, Chicago	1.90	1.90	1.90	1.70
Plates, New York	2.13	2.13	2.13	1.598
Structural shapes, Pittsburgh	1.85	1.85	1.85	1.60
Structural shapes, Chicago	1.90	1.90	1.90	1.70
Structural shapes, New York	2.10¼	2.10¼	2.10¼	1.86775
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	1.70
Hot-rolled strips, Pittsburgh	2.00	2.00	2.00	1.60
Cold-rolled strips, Pittsburgh	2.80	2.80	2.80	2.00

Finished Steel

	July 3, 1934	June 26, 1934	June 5, 1934	July 5, 1933
Per Lb.:	Cents	Cents	Cents	Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.65	2.65	2.65	2.25
Hot-rolled annealed sheets, No. 24, Gary	2.75	2.75	2.75	2.35
Sheets, galv., No. 24, P'gh	3.25	3.25	3.25	2.85
Sheets, galv., No. 24, Gary	3.35	3.35	3.35	2.95
Hot-rolled sheets, No. 10, P'gh	2.00	2.00	2.00	1.65
Hot-rolled sheets, No. 10, Gary	2.10	2.10	2.10	1.75
Wire nails, Pittsburgh	2.60	2.60	2.60	1.85
Wire nails, Chicago dist. mill	2.65	2.65	2.65	1.90
Plain wire, Pittsburgh	2.30	2.30	2.30	2.10
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.15
Barbed wire, galv., Pittsburgh	3.00	3.00	3.00	2.35
Barbed wire, galv., Chicago dist. mill	3.05	3.05	3.05	2.40
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$4.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$11.75	$11.75	$11.75	$11.75
Heavy melting steel, Phila	10.50	10.50	10.50	10.00
Heavy melting steel, Ch'go	9.75	9.75	9.75	9.87½
Carwheels, Chicago	9.75	9.75	9.75	9.50
Carwheels, Philadelphia	12.50	12.50	12.50	10.25
No. 1 cast, Pittsburgh	12.25	12.25	12.25	10.50
No. 1 cast, Philadelphia	12.25	12.25	12.25	10.25
No. 1 cast, Ch'go (net ton)	7.50	7.50	7.50	8.75
No. 1 RR. wrot., Phila	12.25	12.25	12.25	10.75
No. 1 RR. wrot., Ch'go (net)	7.50	7.50	7.50	6.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.85	$3.85	$3.85	$2.00
Foundry coke, prompt	4.60	4.60	4.60	2.75

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery‡	8.75	8.75	8.25	8.25
Lake copper, New York‡	9.12½	9.12½	8.62½	8.50
Tin (Straits), New York	51.37½	50.87½	51.45	46.50
Zinc, East St. Louis	4.35	4.20	4.25	4.50
Zinc, New York	4.70	4.55	4.60	4.87
Lead, St. Louis	3.60	3.85	3.85	4.15
Lead, New York	3.75	4.00	4.00	4.30
Antimony (Asiatic), N. Y.	7.75	7.80	8.25	6.50

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables. ‡Blue Eagle copper.

▲ ▲ ▲

▲▲▲ The Iron Age Composite Prices ▲▲▲

	Finished Steel	Pig Iron	Steel Scrap
July 3, 1934	2.199c. a Lb.	$17.90 a Gross Ton	$10.67 a Gross Ton
One week ago	2.199c.	17.90	10.67
One month ago	2.199c.	17.90	10.67
One year ago	1.953c.	15.01	10.54
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low	High	Low	High	Low
1934	2.199c., April 24	2.008c., Jan. 2	$17.90, May 1	$16.90, Jan. 27	$13.00, Mar. 13	$10.67, June 5
1933	2.015c., Oct. 3	1.867c., April 18	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.977c., Oct. 4	1.926c., Feb. 2	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.42, July 5
1931	2.037c., Jan. 13	1.945c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.286c., Dec. 11	2.217c., July 17	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22

Holiday Virtually Suspends Pittsburgh Ingot Output

Production Down to 10 Per Cent in Both Pittsburgh and Valleys — Price Declines Disturb Outlook for Industry

PITTSBURGH, July 3.—Ingot output this week in the Pittsburgh district is at the lowest point of the year, having receded 32 points to 10 per cent of capacity. A sharp drop also is recorded in the Valleys and nearby northern Ohio mills, where operations have fallen 40 points to 10 per cent. A more moderate decline is reported in the Wheeling district, where output has shrunk 23 points to 40 per cent. Although a rather sharp curtailment in production had been expected after the turn of the quarter as a result of greatly depleted backlogs, the decline that has occurred has surpassed general predictions.

The low rate of activity, however, is largely due to general suspensions during the holiday week. Resumption at some mills will take place at midweek, while at others schedules will be resumed next Monday. A fair rebound from the present low rate is therefore to be expected.

A similar recess is being enjoyed at most finishing mills, which had been very actively engaged for practically all of the second quarter, and had been severely pressed in many cases to meet the June 30 deadline on second quarter shipments. The pause is thus considered welcome by many producers, since it will provide an opportunity to check over stocks of finished material. .

Resumption of operations will be largely predicated on production for replenishment of stocks. In the meantime, consumer buying for third quarter has not made any headway. In addition to generally heavy consumer inventories, another temporary barrier to third quarter contracting is the present unsettlement surrounding general price reductions.

Reduced prices have been filed on sheet bars, billets, blooms and slabs; soft steel merchant bars, plates and shapes; hot-rolled annealed sheets, No. 10 and 24 gages, heavy cold-rolled sheets, No. 10 gage, and light cold-rolled sheets, No. 20 gage; tin mill black plate; galvanized No. 24 gage; vitreous enameling stock No. 20 gage; long ternes; and hot-rolled strip and cold-rolled strip. Reductions range from $1 to $4 a ton, practically canceling an average of 50 per cent of the advances nominally effected early in second quarter. Up to the present time, wire products, tubular goods and tin plate have not been slated for reductions.

Pig Iron

Sellers report very slim order books for third quarter. No carryovers of June tonnage are in evidence, and forward buying lacks the incentive of possible price advances. The new prices at Neville Island and Sharpsville are now nominally established, but have not been tested except on spot carlot business. Merchant furnaces at those points continue in blast.

Semi-Finished Steel

Sheet bars will be reduced $2 a ton on July 10, to $28, Pittsburgh and Youngstown. Billets, blooms and slabs will likewise be reduced on that date $2 a ton to $27, Pittsburgh and Youngstown. When these reductions are established the net advances since the old prices applying early in second quarter will amount to only $2 a ton on sheet bars, and $1 on billets, blooms and slabs. Non-integrated mills in most cases have entered third quarter with very moderate stocks. Such tonnage was practically all placed at prices prevailing early in second quarter.

Bolts, Nuts and Rivets

A fair amount of third quarter contracting is reported. Consumers, however, are not so generally inclined this quarter as in the second quarter to commit themselves far ahead. Spot business is adding little to general activity.

Bars

A price of 1.80c., Pittsburgh, on soft steel merchant bars has been filed for establishment on July 7. This represents a reduction of $2 a ton from the present base, and an advance of only $1 a ton above the old price applying early in second quarter. The 1.90c., Pittsburgh, price has not been severely tested, only a small amount of fill-in tonnage having been placed at this quotation toward the close of second quarter. Practically all producers are expected to follow the initial filing with similar reductions. Until the market becomes established uniformly on the reduced basis, consumers will probably remain in the background. The most likely prospect for early bookings is the motor car industry.

Large tonnages for dam construction on the Pacific Coast are enlivening the billet steel reinforcing market.

Some producers in this district are not expecting to benefit from that work, owing to the geographical location. Private work is practically nonexistent. All new work is being figured on the basis of 2.05c. a lb., Pittsburgh, for straight lengths as quoted by distributers.

Rails and Track Accessories

Backlogs of Government-sponsored rail and track accessory purchases are steadily dwindling. Little new business is appearing to take up the slack, and producers are spreading out present tonnage as much as possible. Production in the current week has been sharply curtailed, owing to the holiday.

Cold-Finished Steel Bars

Contracting for third quarter has been on a very restricted basis. The prospective reduction in the hot-rolled bar price is not considered likely to affect the cold-finished steel bar base, although no definite assurance is thus far provided. The cold-finished bar price has not been advanced since Jan. 1, 1934, and has therefore not provided for the advance in hot-rolled bars established early in April.

Plates and Shapes

A reduction of $1 a ton on plates and shapes has been filed for effect on July 10, placing the Pittsburgh base at 1.80c. a lb. This reduction will result in a net advance over the early second quarter price of only $2 a ton.

Fresh specifications for structural steel are restricted to minor projects. Awards in this district last week included 300 tons for the Fort Pitt Brewing Co. stock house at Sharpsburg, Pa., and 200 tons for a boiler house for Westinghouse Air Brake Co. The plate market is very dull and unchanged.

Tubular Products

Tube mills, while generally inactive in the fore part of the current week, will resume schedules after the holiday in order to replenish depleted stocks of pipe. Heavy movement of oil country goods toward the close of the last quarter accounted for the largest part of stock reductions. The immediate outlook for business is cheerful only from the standpoint of an expected sustained demand for oil country goods. Drilling activity is apparently fairly brisk in many oil producing fields, and a major share of the recent movement of tubular goods is believed to have gone into immediate consump-

(Continued on Page 62)

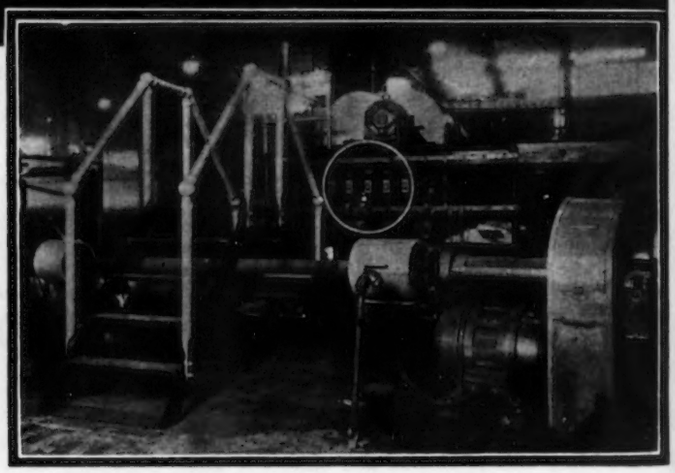
ONLY 1½ CENTS A YEAR

Here are some of the Linestarters on a control balcony in the steel mill where the remarkable low maintenance cost of 1½ cents a Linestarter per year was established.

Class 11-200-H7
5 hp., 220 volt
7½ hp., 440/550 volt

Class 11-200-A7
10 hp., 220 volt
20 hp., 440/550 volt

Notice the attractive appearance of the latest designs of Linestarters which have the new dome-type enclosing cabinet.



Push-button stations (shown in circle) in steel mill for control of the motors driving straightening rolls.

Westinghouse

FOR CONTACT RENEWALS *per*

WESTINGHOUSE LINESTARTER *in this Steel Mill*

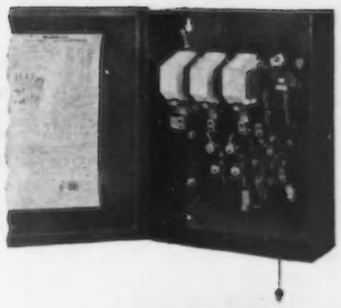
This record, made under severe steel mill conditions, shows the way to motor-control savings in every industrial plant.

THERE'S no tougher proving ground for electric control apparatus than a steel mill. With contacts opening and closing in an atmosphere of metallic dust . . . frequent overloads . . . severe shocks and vibration, equipment must be *right* to stand up in service.

In a steel mill near Pittsburgh, more than 200 Westinghouse "De-ion" Linestarters were installed about a year and a half ago. They have been controlling squirrel-cage motors on auxiliary mill drives, operating at approximately 50 per cent capacity. During this time, contact renewals on all these Linestarters have cost only four dollars and fifty cents—*averaging only 1½ cents per starter per year.*

Motor starters in your plant may not have to withstand such severe conditions as found in steel mills. But you *are* interested in reducing operating costs; and this example shows the way to substantial savings in motor starter repairs and shut-down time.

Let us send you a copy of our new motor and control application book. You'll find it a valuable guide in applying the type of motor and control best suited to give maximum results under each particular operating condition. Send the coupon today.



Westinghouse "De-ion" Linestarter for squirrel-cage motors up to 20 horsepower. Designed for general application, it is suitable for most plant operating conditions.

Explosion-resisting Linestarter for the safe control of motors in hazardous atmospheres of explosive gases, such as exist in refineries, chemical plants, dry-cleaning plants and paint factories.

This is the dust-tight and weather-proof Linestarter. Mounted in a cast-iron cabinet, it is particularly fitted for severe service conditions.

GET THIS NEW BOOK

Westinghouse Electric & Mfg. Co.
Room 2-N—East Pittsburgh, Pa.

Gentlemen: Send me your new book "For Any Operating Condition, there's a Westinghouse Induction Motor and Control"

Name .....
Company .....
Position ..... T 79979
Address ..... IA 7-5-34

Linestarters

(Continued from Page 59)

tion. Occasional carlot orders for seamless steel boiler tubes and lap welded steel pressure tubes represent the only activity in this group. A pick-up in demand for mechanical tubing is in prospect if automotive producers realize their plans for larger assemblies in July.

Wire Products

Most wire mills completed shipments by the deadline for second quarter tonnage on June 30, and have started the new period with very light back-logs. A majority of wire producers have closed their plants during the holiday week, with some resuming on Thursday. Production for the week is estimated roughly at 25 per cent of capacity.

Sheets

The following prices have been filed, to become effective at Pittsburgh, July 7: Hot-rolled annealed, No. 10 gage, 1.85c.; hot-rolled annealed, No. 24 gage, 2.45c.; heavy cold-rolled, No. 10 gage, 2.50c., and light cold-rolled, No. 20 gage, 2.95c. Effective July 10, the following prices will apply: tin mill black plate, 2.75c.; galvanized No. 24 gage, 3.10c.; vitreous enameling stock, No. 20 gage, 3.10c., and long ternes, unassorted 8 lb. coating, 3.45c. These reductions range from $1 to $4 a ton below the higher prices nominally established in April, and represent advances over the previous quotations of $2 to $4 a ton. Some spot July business had already been received at the recently advanced second quarter quotations, but sellers now face the prospect of adjusting such orders on the lower bases that will apply next week. Most finishing mills are not operating this week, but many will probably resume on a very restricted schedule after the holiday week.

Strip Steel

A price of 1.85c., Pittsburgh, for hot-rolled strip has been filed to become effective on July 7. A filing on cold-rolled strip of 2.60c. will reduce this grade $4 a ton on July 11. With all producers expected to file similar reductions, the strip market next week will be generally established at the lower bases. The new quotations will represent a $3 a ton drop from the present nominal base of 2c., Pittsburgh, on hot-rolled, and an advance of $2 a ton over the quotation ruling early in second quarter. On cold-rolled the new filing will result in a net advance of $4 a ton over the price ruling early in second quarter. Practically all strip mills are taking advantage of the holiday week with shutdowns until after Wednesday.

Tin Plate

All important units are inactive this week owing to the holiday. Resumption of schedules is expected some time next week. Specifications and new orders are very scarce.

Coal and Coke

Effective July 1, many changes were made in the bituminous coal code price setup. These changes included the revamping of market areas and some reductions in bituminous prices, ranging from 2c. to 10c. or 15c. a ton.

Scrap

With most mills inactive during the holiday week, scrap is virtually stalemated. Neither consumers nor dealers are manifesting the slightest interest in the market, although the latter group believes that some replenishment buying is due very soon. Just what is in store for scrap values in the early future is not clearly discernible at the moment. Reductions in finished steel prices will likely influence consumers in their ideas of buying prices for scrap. On the other hand, distress material is very scarce, consumer stock piles are believed to be very low and dealers are in a somewhat more enviable position than they occupied at the outset of second quarter, when heavy dealer stocks failed to be absorbed quickly enough to support scrap prices. In the current week major grades are nominally unchanged. A consumer-producer transaction, covering a restricted tonnage of low phosphorus billet crops, involved a delivered price of $14.75. A consumer purchase from several dealers covering a moderate tonnage of that grade last week was made at $16, delivered on a high freight rate. A fair appraisal of the average value of low phosphorus billet crops is therefore placed at $15 to $15.50. Tenders will be accepted on July 11 by the Pennsylvania Railroad on about 25,000 tons of scrap, of which 4500 tons is No. 1 heavy melting. Only 500 tons of No. 1 steel is included in the Baltimore & Ohio list of 8900 tons closing July 9.

New Great Lakes Mill To Boost Detroit Capacity

GREAT LAKES STEEL CORPN. has announced that it will begin construction immediately of a continuous hot and cold rolled strip mill which will make sheets up to 75 in. in width, largely for the automobile industry. The mill will be erected at a total cost of 12 million to 15 million dollars.

This is said to be the largest project in the heavy industries line to be placed in many months. It is expected that the mill will be ready to operate early in 1935.

The new continuous mill will consist of a battery of nine stands of four-high hot mills and four stands of cold mills. Production of the new mill will be supplemented by tonnage rolled on the sheet mills of the Michigan Steel Division particularly in the lighter gages. The structure which will house the new continuous mill will be approximately 1000 ft. long, 120 ft. wide and will be located on filled-in ground west of the present mill buildings and adjacent to the Detroit, Toledo and Ironton Railroad.

The present properties of the Great Lakes Co., together with its Michigan Steel and Hanna Furnace Divisions, are two blast furnaces, eight 150-ton open-hearth furnaces, blooming mill, 21-in. continuous sheet bar and billet mill, 20-in. continuous hot strip mill, 10-in. and 14-in. merchant bar mills and hot-rolled and cold-rolled sheet mills.

During 1933 Great Lakes built two open-hearth furnaces, thereby increasing its number of furnaces from six to eight.

With revelation of the plans of the Great Lakes Co., attention is focused on the fact that steel finishing capacity is increasing more rapidly at Detroit than in any other section of the country. Early this year the Ford Motor Co. announced plans for a continuous strip mill to make hot-rolled and cold-rolled sheets. To be completed by the end of this year, this mill will cost $10,000,000. McClough Steel Corpn., Detroit, recently placed an order for a 20-in. Steckel type reversing hot strip mill which it is expected will be in operation in September. In May, Rotary Electric Steel Co. began construction of a building to house a mill to make cold-rolled strip up to 10 in. in width.

Even with these four projects under way, further expansion of steelmaking capacity at Detroit in the next few years is looked for. A prominent steel company is known to have approached the Ford Motor Co. recently with an offer to purchase its steel mills at Dearborn, but it met with no encouragement. It apparently is the avowed intention of this company to erect its own mills at Detroit for production of flat-rolled steel if it is unable to acquire satisfactory existing properties. Two other important steel makers are understood to have had options on desirable mill sites in the southern end of metropolitan Detroit. It is not known whether these companies have permitted their options to lapse.

Future Steel Requirements Uncertain at Chicago

Ingot Output Drops To 28 Per Cent As Mills Suspend Over Holiday—Price Reductions Filed On Many Products

CHICAGO, July 3.—Price reductions of $1 to $4 a ton on sheets and $3 a ton on hot-rolled strip will become effective in this district on July 7. Cuts of $2 a ton on bars, billets, blooms, slabs and sheet bars and $1 a ton on plates and shapes go into effect on July 10. A further reduction on bars and billets at Duluth, effective July 13, preserves the new differential over Chicago which was recently narrowed to $2 a ton. Cold-rolled strip has been lowered $4 a ton to 2.60c., Cleveland, but as yet no changes have been made in prices of wire rods or finished wire products. Warehouse prices have been reduced in line with the cuts in mills prices.

Whether or not the price revisions will have a stimulating effect on business will not become apparent until consumers have had an opportunity to work off some of their stocks. At the moment buying is at a low ebb, and there is little interest in contracting except among certain consumers like the railroads who find it a convenience to cover for quarterly periods.

Mill operations in this district will pick up slowly after the Independence Day suspension and ingot output has slumped sharply. Raw steel production in the Chicago district now averages 28 per cent of capacity, a decline of 24 points in the past week. Pig iron output has been curtailed by the banking of two steelworks stacks, leaving only 12 blast furnaces active in this district.

Prospects of a renewal of railroad buying have been dimmed by a decline in carloading on roads serving the drought-stricken area. The Milwaukee, for example, has abandoned its plan of seeking Government funds for the purchase of 30 locomotives.

Pig Iron

There are no present indications of a change in pig iron prices in sympathy with reductions in steel quotations. Meanwhile melters have good sized inventories and one of the two active merchant stacks in this district has changed to basic iron, while the other is making foundry grades for stock. Pig iron shipments in June were 70 per cent greater than in May, according to final figures. Resumption of buying is expected in August if business prospects grow no worse. Foundry coke shipments, considered a good measure of melt, were only 12 per cent lower in June than in May.

Reinforcing Bars

Lettings are few, but several new public projects have come out for bids and considerable additional work of this type is in sight, particularly road construction. Effective July 2 the trucking rate within the switching limits of the metropolitan district was advanced from 2½c. to 10c. per 100 lb. The previous rate, established under the code, proved to be far below actual costs.

Plates

Plate prices have been reduced $1 a ton to 1.85c. a lb., Chicago, effective July 10. Tank work shows no increase in volume and no new railroad tonnage has come into the market. Carriers in the drought area are curtailing expenditures because of impending losses in traffic. Local mills are figuring on the steel for a penstock and trash track at the Grand Coulee Dam, Almira, Wash., amounting to 4600 tons.

Structural Material

Prices of structural shapes have been cut $1 a ton to 1.85c. a lb., Chicago, effective July 10. Mills sales of plain material have shown a moderate gain over the previous week, but awards are light. Bids are to be taken on the Bettendorf, Iowa, bridge, requiring 5200 tons, on July 6.

Bars

Bars have been reduced $2 a ton to 1.85c. a lb., Chicago, effective July 10. Bar business is rather light following the completion of second quarter shipments. It is questionable whether a price cut at this time will have much effect on buying, since leading consumers have accumulated considerable stock. Consumption, however, is fairly good for the season. Chevrolet will turn out about 90,000 cars this month and Ford output is expected to be good except for a shutdown of one week for inventory. The Wisconsin producer of automobiles has curtailed operations sharply. Farm equipment production has entered its dull season, but truck and tractor plants are still fairly busy.

Wire Products

Demand is light following the completion of second quarter shipments, and mill operations have slumped. Although the extent of drought damage to farm crops is still uncertain, a sharp curtailment of farmer buying power is a foregone conclusion. A shortage of hay has stimulated shipments from one locality to another, with the result that sales of bale ties have increased. Price reductions have not extended to wire products.

Rails and Track Supplies

No new business has been booked, but rail mill operations continue to average 40 per cent of capacity. Specifications for track fastenings have improved.

Sheets

No. 10 hot-rolled sheets have been reduced $3 a ton to 1.95c. a lb., Gary, No. 24 hot-rolled annealed sheets have been cut $4 a ton to 2.55c. a lb., Gary; No. 10 heavy cold-rolled sheets have been marked down $1 a ton to 2.60c. a lb., Gary; and No. 20 cold-rolled sheets have been reduced $4 a ton to 3.05c. a lb., Gary. The new prices are effective July 7. Local mills which had booked a fair amount of spot business at the previous prices have been forced to adjust them to the new levels Mills will be idle until after the Independence Day holiday.

Strip Steel

Hot-rolled strip has been reduced $3 a ton to 1.95c. a lb., Chicago; while cold-rolled strip has been cut $4 a ton to 2.60c. a lb., Cleveland.

Semi-Finished Steel

Billets, blooms and slabs have been reduced $2 a ton to $27 Chicago or Gary, and sheet bars have been cut a like amount to $28, Chicago or Gary.

Warehouse Business

Warehouse prices have been reduced in line with the changes in mill quotations. The new prices are 3.20c. a lb. on plates and shapes, 2.95c. on soft steel bars, 3.30c. on hot-rolled strip, 3.90c. on No. 24 hot-rolled annealed sheets, 4.55c. on galvanized sheets and 3.05c. on No. 10 hot-rolled sheets.

Cast Iron Pipe

Madison, Wisc., has awarded 700 tons to Central Foundry Co. Considerable Government-financed work is still pending but is being held up by red tape.

Scrap

Railroad lists now being disposed of disclose no change in the price of melting steel, but the holding up of shipments by steel producers points to a weaker market. In the absence of consumer interest the whole list remains more or less nominal.

Cleveland Mills Reduce Output to 15 Per Cent

Holiday Week Results in Almost Complete Suspension of Operations — Price Decline Resented by Many Consumers

CLEVELAND, July 3.—Price reductions of $1 to $4 a ton from the schedules that had been set up for the third quarter on most finished steel products have overshadowed all other developments in the finished steel market. Many consumers have voiced objections to the reductions, believing that they will prove a disturbing factor in business recovery. They are also complaining because they loaded up with stocks at the end of the second quarter with the expectation that prices named for the third quarter would be maintained.

While the new prices are higher than the second quarter contract prices, the advances on some products, particularly bars which are up only $1 a ton, probably would not have been enough to warrant consumers to stock up to any extent. Some orders for July shipment were placed at the discarded higher schedules mostly for material that mills could not get out in June and this steel will be shipped at the prices just announced. However, as none of the new prices go into effect until July 7, tonnage shipped this week against these orders would carry the previously named third quarter prices. Consequently no steel will be shipped this week unless the buyer is in such urgent need of it that he is willing to pay the premium price. Until the new prices become effective any sales will have to be made at the previously filed third quarter prices, but producers may revise the price to the new schedule after the latter becomes effective.

The combination of little tonnage on mill books and the holiday resulted in a drastic cut in ingot output in the Cleveland-Lorain territory this week. Production dropped to an average of about 15 per cent or less of capacity, a decline of about 40 points. Both local open-hearth plants went down Friday night and one of these will resume Thursday with six furnaces. The Lorain plant suspended operations today until next week. Finishing mills are shut down and several blast furnaces are banked.

Pig Iron

All iron specified against second quarter contracts was shipped before July 1, and buyers, in view of the $1-a-ton advance that is to apply during the current quarter, did not allow much tonnage to lapse. Heavy shipments in the latter part of the second quarter have greatly reduced stocks of some of the merchant furnaces which are now short of certain grades. These stocks will be replenished this month. Little new buying is expected for several weeks.

Sheets

Mills in this territory will meet the reduced prices filed with the American Iron & Steel Institute. Under the new schedule, No. 10 hot-rolled sheets are only $2 higher and No. 24 hot-rolled annealed and cold-rolled sheets are $4 a ton higher and galvanized sheets are $5 a ton higher than the prices in effect during the second quarter, but from $1 to $4 a ton lower than the prices that had been named for the third quarter. The new prices are 1.85c. for No. 10 hot-rolled, 2.45c. for No. 24 hot-rolled annealed, 2.50c. for No. 10 cold-rolled, 2.95c. for No. 20 cold-rolled and 3.10c. for galvanized. These prices become effective July 7 except on galvanized sheets, on which the change goes in effect July 10. A small tonnage was sold in June for July shipment at the price schedules that had been named for the third quarter, but these will be shipped at the revised prices.

Strip Steel

The new 1.85c. Pittsburgh price on hot-rolled strip is being generally adopted. This is an advance of $2 a ton over the price that prevailed during the second quarter, but $3 a ton below the price that was scheduled for the current quarter. Cold-rolled strip has been established at 2.60c., Cleveland, or $4 a ton above the second quarter price and $4 below the price that had been scheduled for the current quarter. With the new price set-up the differential that has existed between cold-rolled strip and cold-rolled sheets is preserved.

Iron Ore

Shipments from Lake Superior ports during June were 4,460,807 tons, as compared with 2,630,578 tons in May, and an increase of 3,175,538 tons over June last year. The movement for the season until July 1 was 7,091,385 tons, as against 4,826,372 tons during the same period last year, a gain of 213 per cent.

Bolts, Nuts and Rivets

Considerable bolt and nut business has been booked in third quarter contracts. As prices were not advanced for the quarter, makers do not expect their prices will be affected by the reduction in the steel bar price. However, with the reduced bar price, rivet manufacturers may find considerable resistance to the $5-a-ton price advance for contracts that became effective July 1. Rivet specifications against old contracts have been heavy and makers have extended until July 15 the deadline date for shipments against these contracts.

Bars, Plates and Shapes

Bars, shapes and plates have been established at 1.80c., Pittsburgh, effective July 9, placing the three products on the same base. The Cleveland bar base is 1.85c. This is a $1 a ton advance over the second quarter contract price for bars and $2 a ton advance for shapes and plates, but is $1 a ton less than the withdrawn prices. Billets and rail steel reinforcing bars are expected to be revised to maintain the recent differentials. Alloy steel bars had been marked up $2 a ton for the current quarter and will be reduced. Structural inquiry includes 600 tons for a post office in Jamestown, N. Y.

Old Materials

Some of the consumers that have been taking blast furnace scrap have held up shipments and with virtually no outlet at present for this scrap, blast furnace grades have declined 25c. a ton. With open-hearth operations curtailed there is no demand for steel-making grades, quotations on which are nominal. Several of the leading automobile companies will close this week on July lists that are considerably smaller than their June lists. The New York Central Railroad will close July 12 on a blanket list.

Roughing Mill Ordered By Tata Company

The Mackintosh-Hemphill Co., Pittsburgh, has received an order for a new type of roughing mill for sheet bars 33 and 20 x 48 in. in size for the Tata Iron & Steel Co., Ltd., Jamshedpur, India, through the Perin Engineering Co., New York. The mill will be fully mechanized with continuous pair and pack furnaces and will be for unit No. 2 of the Tata sheet mill extension.

As reported in THE IRON AGE, Oct. 5, 1933, page 31, the first unit of this mill, which was also installed by the Perin company, established a number of unusual records in production during its first 27 weeks' operation.

Heavy PWA Allotments In New York and Vicinity

Plans Being Rushed for Numerous Jobs Which Will Take Large Steel Tonnages—Price Reductions Effective Within Week

NEW YORK, July 3.—Price reductions on a wide range of finished steel products are the center of market interest this week. Attention is also directed to the recent Presidential order allowing bidders on contracts financed by Federal funds to make price reductions up to 15 per cent from levels filed with code authorities. If such reductions are made, however, they must be extended to the trade generally on further business, thus reducing the entire price level by that amount. This process could be repeated indefinitely and lead to a descending spiral of prices. It appears likely, however, that the steel code will not be affected by this order.

New prices filed with the institute on finished steel products range from $1 to $4 a ton and will just about cut in half the higher quotations which became effective on new business in April and May. Thus far, no changes have been filed on tin plate, reinforcing bars, pipe or wire products. The new quotations, which are published elsewhere in this issue, become effective July 7, 9, 10 and 11.

New business placed in the last week has naturally been very light and such tonnage as might have been placed will now be deferred until the lower prices go into effect. Recent public works allotments announced in Washington include many jobs in the New York metropolitan district, for which plans will come out in the near future. The Board of Transportation, New York, will take bids July 20 on rails, tie plates, spikes, bolts, nuts, washers and other products required for the completion of the municipal subway. The Panama Canal Zone has placed 725 tons of rails and accompanying track supplies with the United States Steel Products Co. and the Bethlehem Steel Co. Bids will be taken Aug. 15 by the Navy Department on 41,000 tons of shapes and plates to be used in the construction of four cruisers, 14 destroyers and six submarines.

Pig Iron

The iron under contract which remained unshipped on June 30 can be rewritten at the higher third quarter prices if the consumer neglected to specify. However, if the producer has been unable to ship for any reason the case can be submitted to the Iron and Steel Institute for an individual decision. It is possible that conditions may at times warrant the approval of belated shipments at prices below the prompt market. In this territory practically all consumers have elected to accept all their second quarter contract tonnages and plant stocks are consequently quite large. The present market is very quiet, and only 950 tons was sold last week for spot and extended delivery, as compared with 1200 tons in the preceding week and 350 tons booked two weeks earlier. It is very doubtful that any appreciable tonnage will come into the market during the next month, and for this reason it is equally doubtful that prices will be reduced.

Reinforced Steel

Truck delivery of reinforcing bars was formerly charged on a basis of 50c. and $1 a ton from the nearest railroad station to a job but these rates have been raised to a uniform level of $2 a ton throughout the country. The market here is very dull and consists mostly of small lots. Recent Federal allotments for construction purposes should be reflected in fairly good awards during the summer months. Joseph T. Ryerson & Son, Inc., has been awarded 200 tons for a Wellesley, Mass., college building and Truscon Steel Co. will furnish 100 tons for a school at Johnson City, N. Y.

Scrap

This buying market is having a transient period of easiness, and several grades have declined slightly. The price setback is a reflection of holiday inactivity and a general 10-day delay of contract shipments. Even foreign buyers are watchfully awaiting developments and are limiting their current purchases to special lots at favorable prices. Both heavy breakable cast and No. 2 heavy melting steel have declined 25c. a ton for eastern Pennsylvania delivery and rerolling rails are 50c. lower on the basis of a sizable sale made for Japanese delivery. A little No. 2 steel is still going to Pencoyd and Conshohocken, Pa., and some cast grades are being purchased for Harrisburg, Pa., delivery.

Cincinnati Market Becomes Quiet

CINCINNATI, July 3.—Consumer uncertainty as to third quarter business prospects is restricting the district metal working market. New business, the past week, was small, representing renewals of the few contracts, cancelled by code provisions, and scattered car orders for immediate needs. Throughout the month, consumers resisted new commitments in anticipation of a greater than seasonal business recession. Shipments, on the other hand, have been the best in the past year. Melters, not finding a need for new purchases, have nevertheless accepted all iron ordered for this quarter. Prices remain unchanged, with furnace interests holding to published rates.

Steel

Demand for finished sheets declined precipitously in the past week, as consumers sought to ascertain third quarter requirements before placing new orders. Tonnage orders call for production at less than 30 per cent of capacity output. As in other markets, shipments, the past week, held to a high level. Auto manufacturers indicate a lull in activity and their specifications are down. Prices on many items were reduced from $1 to $4 a ton, but this failed to stimulate buying. The leading interest will operate at about 20 per cent this week while taking inventory.

Coke

Shipments of foundry coke tend downward in keeping with shrinkage of foundry operations. Prices are steady.

Scrap

Curtailment of mill activity weakened the old materials market further last week. Dealers are without substantial new orders and shipments declined as old contracts were completed. Prices are unchanged and nominal.

Production Drops Under 20 Per Cent in East

Naval Vessels, Calling for 40,000 Tons of Steel, Constitute Most Important Pending Work—Prices Reduced

PHILADELPHIA, July 3.—Effective July 7, steel prices in eastern Pennslyvania, along with those in other districts, will be reduced for the third quarter from $1 to $6 per ton under those now being quoted. Virtually all lines with such exceptions as skelp, tin plate, wire products and pipe are affected. Plates and shapes are down $1 per ton to 1.90c., Coatesville, and Bethlehem, Pa. The largest decline was in deoxidized sheets, which were reduced $6 to 2.85c., Pittsburgh. Galvanized sheets No. 24 were decreased $3 per ton to 3.10c. Steel bars were reduced $2 per ton to 1.80c., Pittsburgh, readjusted to the same level as plates and shapes. Prices of alloy steel bars were lowered $2 a ton to 2.45c. Hot and cold rolled sheet prices saw cuts of $1 to $4 a ton. The new prices range from $1 to $5 per ton over second quarter billing prices.

Meanwhile with second quarter shipments completed last Saturday, mills have entered the third quarter with extremely light bookings. The result has been a precipitate drop in operations. Open-hearth output in this district has fallen off 26 points from 45 per cent to approximately 19 per cent of capacity. Part of the decline, however, is due to the Fourth of July holiday. Three furnaces at least will begin making steel on Friday and after the present week one or two others may resume. The rate after that period probably will not exceed 23 or 24 per cent pending further pickup in business.

Shipments necessarily are halted awaiting the reduced prices.

The chief orders on books are for identified structures, on which tonnage at old prices remains to be delivered. This represents a fair backlog of plates and shapes, the latter exceeding the former.

The 24 naval vessels on which bids will be taken Aug. 15 will call for about 40,000 tons of plates and shapes, and represent the largest single tonnage that is in early prospect.

The trade is considerably disturbed over the Presidential order of last Friday which is construed to mean a 15 per cent reduction in prices unless an exemption is obtained.

Pig Iron

Unlike steel prices, no change in the price level of pig iron quotations for the third quarter is contemplated. They remain at $1 a ton above the second quarter prices. Furnaces report that second quarter shipments were well above those of first quarter and some makers have fair-sized bookings for the third quarter, though this condition is not general.

Plates, Shapes and Bars

Under the new third quarter prices, plates and shapes are reduced $1 per ton under those previously quoted, plates at 1.90c., Coatesville, Pa., and shapes at 1.90c., Bethlehem. The principal bookings are for identified jobs, with those for structural shapes somewhat heavier than those for plates. Merchant steel bars were reduced $2 a ton to 1.80c., Pittsburgh, being placed on a parity with plates and shapes. Bookings are extremely light. The largest pending business involves about 40,000 tons of plates and shapes for 24 naval vessels on which bids will be taken Aug. 15. The vessels to be built in private yards are one heavy and one light cruiser, two 1850-ton destroyer leaders, five 1500-ton destroyers and three submarines. The ships to be built at Navy yards are two light cruisers, seven 1500-ton destroyers and three submarines. Profits on these ships are limited to 10 per cent.

Sheets

Demand has shown a sharp falling off since the completion of second quarter shipments. With prices reduced, however, a fair-sized market is expected to develop from the automotive trade. There is also expected to be a rising demand from radio and stove makers. The total business for the month promises to be comparatively light.

Imports

The following iron and steel imports were received here last week: 2750 tons of chrome ore from Turkey; 94 tons of structural shapes, 73 tons of steel bars, 67 tons of steel bands and 15 tons of deformed steel bars from Belgium; 50 tons of sponge iron and 22 tons of cold-drawn steel wire from Sweden, and 18 tons of tungsten ore from China.

Scrap

The market is dull and prices are nominal. With the abrupt decline in steel works operations and indications of slow steel markets for the next month or six weeks, demand for scrap is almost negligible. Several price declines, amounting to 50c. for each grade have followed light sales. They involve No. 2 heavy melting steel, machine shop turnings and forge five. A new specification for No. 2 heavy melting steel has come out, making two specifications for this grade. One consists of No. 2 heavy melting steel with a small percentage of galvanized pipe and another of galvanized pipe, cut bedsteads and similar material, mills accepting the latter at $2 per ton less than the former grade.

Iron Mining Strike Is Settled in South

BIRMINGHAM, July 3. — Pig iron shipments continued at a strong rate up to the end of the month. With the stoppage of $13.50 contracts, the next few weeks are expected to be rather dull from the standpoint of both sales and shipments. Tonnage booked since early April at the current price of $14.50 has been comparatively small, as most foundries covered their second quarter requirements at the old price and many of them are still well stocked for the next month or so. Not much is expected of the market before the middle of August.

Ten furnaces continued to operate last week. No indication has yet been given as to possible operations during July, in the face of a market lull.

Last week the Tennessee Coal, Iron & Railroad Co. settled its iron ore strike and work is to be gradually resumed, starting this week. Efforts are now being made to settle the other company strikes.

Pipe shipments last week were rather light, and June movement ranged from 10 to 20 per cent under May. All of the companies have substantial PWA tonnages on their books, but most of this is held up.

Steel

Birmingham producers have just closed the best month in nearly a year from the standpoint of shipments. Specifications fell off last week, but this was largely due to the fact that most consumers placed their orders during the first half of the month to

be sure they would be filled. On some products order books were closed a week or two ago.

Open-hearth operations last week consisted of 13 active units, a decrease of two as compared with the previous several weeks.

Pacific Coast Strike Continues Tie-Up

SAN FRANCISCO, July 2. — Mill production during the past week has been at full capacity in order to fill second quarter contracts. Due to refilled schedules at higher levels and the absence of pending projects a general decline in production is anticipated.

Strike conditions in Pacific ports remain unchanged, although there is some promise of a settlement through Federal arbitration. The question of the management of hiring halls appears to be the crux of the dispute. The threat to open the port at San Francisco by force did not materialize and the effort of striking unions to cause a general strike likewise failed.

Bookings during the week were for minor tonnages, although a greater volume of business was reported in Southern California. Outstanding among the lettings was the award by San Francisco for 9300 tons of cast iron pipe. Soule Steel Co. took 690 tons of reinforcing bars on four projects. Awards were confined to 1803 tons of reinforcing bars, 1443 tons of plates and 376 tons of structural steel.

Boston Pig Iron and Scrap Markets Quiet

BOSTON, July 3. — With the most active foundries well stocked with pig iron, and operations dwindling, partly because of excessive heat and partly because of the lack of casting orders, the market is virtually at a standstill. Pig iron sellers are now of the opinion that business will not begin to pick up before Aug. 1, or later. However, with the Boston & Maine Railroad's Billerica, Mass., locomotive repair shops reopened, and its Concord and Keene, N. H., car repair shops about to reopen, with shoe factories, textile mills and some of the special machinery and pipe fitting manufacturers fairly busy, the general New England industrial situation is brighter than it was a month ago, and should, sooner or later, be reflected in the pig iron market.

Current scrap prices are no incentive to dispose of holdings, and about the only thing moving is distress material, and comparatively little of that. Stocks of scrap in the hands of the largest New England consumers are by no means excessive, and it is believed these and Pennsylvania consumers will be in the market some time this month.

Pipe Lines

United States Engineer, Kansas City, Mo., asks bids until July 11 for quantity of steel pipe (Circular 1107); four lengths of wrought steel pipe (Circular 1181).

Toronto Pipe Line Co., Toronto, Ont., a subsidiary of British-American Oil Co., Ltd., same place, has authorized surveys for new welded steel pipe line from oil field district at Cut Bank, Mont., to Coutts, Alta., and vicinity, about 36 miles.

Lovelock, Nev., asks bids until July 9 for 61,440 lin. ft. of 8-in., and 9960 lin. ft. of 6-in. for water trunk line. King & Malone, 29 East First Street, Reno, Nev., are consulting engineers.

Huasteca Petroleum Co., Mexico, D. F., a subsidiary of Standard Oil Co. of New Jersey, Inc., New York, has approved plans for new steel pipe line from pumping plants in Cerro Azul district, State of Vera Cruz, Mexico, to bulk terminal plant at Mata Redonda, near Tampico. Cost about $900,000.

Mid-Western Refineries, Inc., Alma, Mich., plans immediate construction of 4-in. welded steel pipe line from new refinery, now in course of erection, to Porter oil field district, Midland County, about 13 miles.

Star Tool & Mfg. Co., Inc., Bridgeport, Conn., has removed from 172 Wade Street to 170 Cherry Street.

Prices of Finished Steel and Iron Products

Note: Prices Filed During Last Week Are Not Effective Until July 7 and Later, and Are Therefore Not Recognized on These Pages This Week—Representative Quotations on New Basis Are Shown on Page 71

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel	*Base per Lb.*
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Duluth	2.05c.
Del'd Detroit	2.05c.
F.o.b. Cleveland	1.95c.
F.o.b. Buffalo	2.00c.
Del'd Philadelphia	2.19c.
Del'd New York	2.23c.
F.o.b. Birmingham	2.05c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel
(For merchant trade)

F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
F.o.b. Moline, Ill.	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Buffalo	1.90c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Billet Steel Reinforcing
(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	2.05c.
F.o.b. Chicago	2.10c.
F.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
F.o.b. Cleveland	2.10c.
F.o.b. Youngstown	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. Birmingham	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.60c.

Rail Steel Reinforcing
(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.45c.

Iron

F.o.b. Chicago	1.90c.
F.o.b. Terre Haute, Ind.	1.85c.
F.o.b. Reading, Pa.	
F.o.b. Danville, Pa.	
F.o.b. Berwick, Pa.	

Cold Finished Bars and Shafting*

	Base per Lb.
F.o.b. Pittsburgh	2.10c.
F.o.b. Chicago	2.15c.
F.o.b. Gary	2.15c.
F.o.b. Cleveland	2.15c.
F.o.b. Buffalo	2.20c.
Del'd Detroit	2.30c.
Del'd eastern Michigan	2.35c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts

Angle Line Posts	*Base per Net Ton*
F.o.b. Pittsburgh	$50.00
F.o.b. Chicago	50.00
F.o.b. Duluth	51.00
F.o.b. Cleveland	50.00
F.o.b. Birmingham	53.00
F.o.b. Houston	59.00
F.o.b. cars dock Pacific ports	67.00

Plates

	Base per Lb.
F.o.b. Pittsburgh	1.85c.
F.o.b. Chicago	1.90c.
F.o.b. Gary	1.90c.
Del'd Cleveland	2.035c.
F.o.b. Coatesville	1.95c.
F.o.b. Sparrows Points	1.95c.
Del'd Philadelphia	2.035c.
Del'd New York	2.13c.
F.o.b. Birmingham	2.00c.
F.o.b. cars dock Gulf ports	2.25c.
F.o.b. cars dock Pacific ports	2.40c.
Wrought iron plates, f.o.b. P'gh	3.00c.

Floor Plates

F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh	1.85c.
F.o.b. Chicago	1.90c.
Del'd Cleveland	2.035c.
F.o.b. Buffalo	1.95c.
F.o.b. Bethlehem	1.95c.
Del'd Philadelphia	2.055c.
Del'd New York	2.1025c.
F.o.b. Birmingham (standard)	2.00c.
F.o.b. cars dock, Gulf ports	2.25c.
F.o.b. cars dock Pacific ports	2.40c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	2.00c.
No. 10, f.o.b. Gary	2.10c.
No. 10, del'd Detroit	2.20c.
No. 10, del'd Phila.	2.29c.
No. 10, f.o.b. Birmingham	2.15c.
No. 10, f.o.b. dock cars Pacific ports	2.55c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.65c.
No. 24, f.o.b. Gary	2.75c.
No. 24, del'd Detroit	2.85c.
No. 24, del'd Phila.	2.94c.
No. 24, f.o.b. Birmingham	2.80c.
No. 24, f.o.b. dock cars Pacific ports	3.25c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.55c.
No. 10 gage, f.o.b. Gary	2.65c.
No. 10 gage, del'd Detroit	2.75c.
No. 10 gage, del'd Phila.	2.84c.
No. 10 gage, f.o.b., Birmingham	2.70c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.15c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	3.15c.
No 20 gage, f.o.b. Gary	3.25c.
No. 20 gage, del'd Detroit	3.35c.
No. 20 gage, del'd Phila.	3.44c.
No. 20 gage, f.o.b. Birmingham	3.30c.
No. 20 gage, f.o.b. dock cars Pacific ports	3.70c.

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	3.25c.
No. 24, f.o.b. Gary	3.35c.
No. 24, del'd Phila.	3.54c.
No. 24, f.o.b. Birmingham	3.40c.
No. 24, f.o.b. dock cars Pacific ports	3.85c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.65c.
F.o.b. cars dock Pacific ports	4.35c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	3.20c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.85c.
No. 28, Gary	2.95c.
No. 28, cars dock, Pacific Coast ports	3.35c.

Tin Plate *Base per Box*

Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate
(F.o.b. Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb.	coating	I.C. $10.00
15-lb.	coating	I.C. 12.00
20-lb.	coating	I.C. 13.00
25-lb.	coating	I.C. 14.00
30-lb.	coating	I.C. 15.25
40-lb.	coating	I.C. 17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	2.00c.
All widths up to 24 in., Chicago	2.10c.
All widths up to 24 in., del'd Detroit	2.20c.
All widths up to 24 in., Birmingham	2.15c.
Cooperage stock, Pittsburgh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Rolled Strips

	Base per Lb.
F.o.b. Pittsburgh	2.80c.
F.o.b. Cleveland	2.80c.
Del'd Chicago	3.08c.
F.o.b. Worcester	3.00c.

Fender Stock

No. 16 and heavier, Pittsburgh or Cleveland	3.20c.
F.o.b. Worcester	3.60c.
No. 17 and lighter, Pittsburgh or Cleveland	3.50c.
F.o.b. Worcester	3.90c.

Hot-Rolled Rail Steel Strips

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Birmingham	1.95c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	*Per Lb.*
Bright wire	2.30c.
Spring wire	3.20c.

To Jobbing Trade

Qualified jobbers are entitled to a reduction of 20c. a 100 lb. from the base price on carload shipments to stock, and of 10c. a 100 lb. on less-carload shipments to stock.

	Base per Keg
Standard wire nails	$2.60
Smooth coated nails	2.60
Galvanized nails:	
15 gage and coarser	4.60
16 gage and finer	5.10
	Base per 100 Lb.
Annealed fence wire	$2.45
Galvanized fence wire	2.80
Polished staples	3.30
Galvanized staples	3.55
Barbed wire, galvanized	3.00
Woven wire fence, base column	63.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

On manufacturers' wire prices at Pacific ports are $9 above the Pittsburgh base. On high-carbon spring wire, prices at Pacific ports are also $9 above Pittsburgh. On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi are $6 a ton over Pittsburgh, while New Orleans and Pacific Coast prices are $8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are $11 a ton above Pittsburgh.

Wire Hoops, Twisted or Welded

	Off List
F.o.b. Pittsburgh	35 and 2½ off
F.o.b. Chicago	35 off

Bale Ties, Single Loop

	Base per Net Ton
F.o.b. Pittsburgh	$63.00
F.o.b. Chicago	64.00
F.o.b. Duluth	65.00
F.o.b. Cleveland	63.00
F.o.b. Birmingham	66.00
F.o.b. cars dock Houston, Galveston, Beaumont, Orange or Corpus Christi, Tex.	72.00
F.o.b. cars dock Pacific ports	74.00

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel			Wrought Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛	+51½	+29½	⅛	+91½	+138
¼ to ⅜	+53½	+35	¼ & ⅜	+11½	+21½
½	+58½	+47	½	+31½	+15
¾	+62	+52	¾	+36½	+20½
1 to 3	+64	+55	1 & 1¼	+39½	+25½
			1½	+43½	+28
			2	+41½	+26

Lap Weld

2	+60	+51	2	+37	+22½
2½ to 3	+63	+54	2½ to 3½	+38	+25
3½ to 6	+65	+56	4 to 8	+40	+28½
7 and 8	+64	+54	9 to 12	+38	+24½
9 and 10	+63½	+53½			
11 and 12	+62½	+52½			

Butt Weld, extra strong, plain ends

⅛	+48½	+33½	⅛	+13	+45½
¼ to ⅜	+51	+38	¼ & ⅜	+2½	+34½
½	+56½	+47½	½	+32½	+17½
¾	+61	+52	¾	+37½	+22½
1 to 3	+63	+55	1 to 2	+43½	+29

Lap Weld, extra strong, plain ends

2	+58	+50	2	+40	+26
2½ to 3	+62	+54	2½ to 4	+45½	+33
3½ to 6	+65½	+57½	4½ to 6	+45	+33½
7 and 8	+64½	+54½	7 & 8	+46	+33
9 and 10	+63½	+53½	9 to 12	+41½	+30
11 and 12	+62½	+52½			

On standard steel pipe an extra 5% off is allowed on sales to consumers while two 5's off apply on sales to jobbers. On less-than-carload shipments prices are determined by adding 20 and 25% and the carload freight rate to the base card. On structural steel pipe the base card is reduced 2 points and two 5's off are allowed to consumers and three 5's off to jobbers.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes
(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

			Cold Drawn	Hot Rolled
1 in. o.d.	13	B.W.G.	$ 8.60	....
1¼ in. o.d.	13	B.W.G.	10.19	....
1½ in. o.d.	13	B.W.G.	11.26	....
1¾ in. o.d.	13	B.W.G.	12.81	....
2 in. o.d.	13	B.W.G.	14.35	$13.04
2¼ in. o.d.	13	B.W.G.	16.00	14.54
2½ in. o.d.	12	B.W.G.	19.29	17.54
2¾ in. o.d.	12	B.W.G.	20.45	18.59
3 in. o.d.	12	B.W.G.	21.45	19.50
3¼ in. o.d.	11	B.W.G.	25.22	22.93
3½ in. o.d.	11	B.W.G.	27.09	24.62
4 in. o.d.	10	B.W.G.	33.60	30.54
4½ in. o.d.	10	B.W.G.	41.08	37.35
5 in. o.d.	9	B.W.G.	51.56	46.87
6 in. o.d.	7	B.W.G.	79.15	71.96

Extras for less-carload quantities:

25,000 lb. or ft. to 39,999 lb. or ft.	5 %
10,000 lb. or ft. to 24,999 lb. or ft.	12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	25 %
Under 2,000 lb. or ft.	40 %

Hot-Finished Lapweld Steel Pressure Tubes
(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

1½ in. o.d.	13	B.W.G.	$ 9.72
1¾ in. o.d.	13	B.W.G.	11.06
2 in. o.d.	13	B.W.G.	12.38
2¼ in. o.d.	13	B.W.G.	13.79
2½ in. o.d.	12	B.W.G.	16.58
2¾ in. o.d.	12	B.W.G.	17.54
3 in. o.d.	12	B.W.G.	18.35
3¼ in. o.d.	11	B.W.G.	21.56
3½ in. o.d.	11	B.W.G.	23.15
4 in. o.d.	10	B.W.G.	28.66
4½ in. o.d.	10	B.W.G.	35.22
5 in o.d.	9	B.W.G.	44.25
6 in. o.d.	7	B.W.G.	68.14

Quantity Extras:

40,000 lb. or ft.	base
25,000 lb. or ft. to 39,999 lb. or ft.	plus 5 %
10,000 lb. or ft. to 24,999 lb. or ft.	plus 12½ %
2,000 lb. or ft. to 9,999 lb. or ft.	plus 25 %
Under 2,000 lb. or ft.	plus 40 %

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$47.00
4-in., del'd Chicago	50.00
6-in. and larger, del'd New York	45.00
4-in. del'd New York	48.60
6-in., and larger, Birmingham	39.00
4-in. Birmingham	42.00

Class "A" and gas pipe, $3 extra

RAILROAD MATERIALS

Rails and Track Supplies

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per gross ton	$35.00
Light rails (from rail steel) per gross ton	34.00
	Base per 100 Lb.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.40
Spikes, boat and barge	2.40
Tie plates, steel	1.90
Track bolts, to steam railroads	3.55
Track bolts, no jobbers, all sizes (per 100 count)	70 per cent off list

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va., Jersey City, N. J.

Girder Rails

	Per Gross Ton
F.o.b. Lorain	$47.00
F.o.b. Steelton	47.00

Splice Bars for Girder Rails

	Base per 100 Lb.
F.o.b. Lorain and Steelton	$4.30

Steel Car Axles

	Base per Lb.
F.o.b. Pittsburgh	2.65c.
F.o.b. Chicago	2.65c.
F.o.b. Birmingham	2.65c.

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, Pittsburgh	75
Stove bolts in packages, Chicago	75
Stove bolts in packages, Cleveland	75
Stove bolts in bulk, P'gh	83
Stove bolts in bulk, Chicago	83
Stove bolts in bulk, Cleveland	83
Tire bolts	60

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.00
F.o.b. Chicago	3.10
F.o.b. Birmingham	3.15

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 5
F.o.b. Cleveland	70 and 5
F.o.b. Chicago and Birm'g'm	70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws, 1 in. dia. and smaller	75, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ¾ in. and smaller	75
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	85
Upset set screws, cut and oval point	75 and 10
Milled studs	65

Alloy and Stainless Steel

Alloy Steel Ingots

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Uncropped .....$42 per gross ton

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $51 a gross ton.
Price del'd Detroit is $54.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base.....2.55c. a lb.
Delivered price at Detroit is 2.70c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (½% Nickel)	$0.25
2100 (2½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
6100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is ½c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.05c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr, 7 to 9% Ni, 0.08 to 0.20% C)

(Base Prices, f.o.b. Pittsburgh)

	Per Lb.
Bars	23c.
Plates	26c.
Sheets	33c.
Hot-rolled strip	20½c.
Cold-rolled strip	27c.

Raw and Semi-Finished Steel

Carbon Steel Rerolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped .....$29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Birmingham.
Uncropped .....$31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.

	Per Gross Ton
Rerolling	$29.00
Forging quality	34.00
Delivered Detroit	
Rerolling	$32.00
Forging quality	37.00
Billets Only F.o.b. Duluth	
Rerolling	$31.00
Forging	36.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or Bessemer	$30.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved	1.70c.
Universal	1.70c.
Sheared	1.70c.

Tube Rounds

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Buffalo	2.00c.
F.o.b. Birmingham	2.05c.

Wire Rods

(Common soft, base)

	Per Gross Ton
F.o.b. Pittsburgh	$38.00
F.o.b. Cleveland	38.00
F.o.b. Chicago	39.00
F.o.b. Anderson, Ind.	39.00
F.o.b. Youngstown	39.00
F.o.b. Worcester, Mass.	40.00
F.o.b. Birmingham	41.00
F.o.b. San Francisco	47.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$19.50	$20.00	$19.00	$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	....	....	19.00	....
Sparrows Point, Md.	19.50	....	19.00	....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	17.50	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	....
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	18.50	18.00	....
Duluth, Minn.	19.00	19.00	....	19.50
Birmingham	14.50	14.50	13.50	19.00
Provo, Utah	17.50	....	17.00	..

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District				
From Everett, Mass.	$20.00	$20.50	$19.50	$21.00
Brooklyn				
From East Pa. or Buffalo	21.77	22.27	21.27	22.77
Newark or Jersey City, N. J.				
From East. Pa. or Buffalo	20.80	21.30	20.30	21.80
Philadelphia				
From Eastern Pa.	20.26	20.76	19.76	21.26
Cincinnati				
From Hamilton, Ohio	19.51	19.51	19.01	20.01
Canton, Ohio				
From Cleveland and Youngstown	19.76	19.76	19.26	20.26
Columbus, Ohio				
From Hamilton, Ohio	20.50	20.50	....	....
Mansfield, Ohio				
From Cleveland and Toledo	20.26	20.26	....	....
Indianapolis				
From Hamilton, Ohio	20.77	20.77	....	....
South Bend, Ind.				
From Chicago	20.55	20.55	....	....
Milwaukee				
From Chicago	19.50	19.50	....	....
St. Paul				
From Duluth	20.94	....	....	....
Davenport, Iowa				
From Chicago	20.26	20.26	....	....
Kansas City				
From Granite City	21.04	21.04	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.....$23.50
Johnson City, Tenn. 19.50
Del'd Chicago 25.15

GRAY FORGE PIG IRON

Valley furnace $18.25

CHARCOAL PIG IRON

Lake Superior furnace $21.00
Delivered Chicago 24.04
Delivered Buffalo 24.28

CANADA

Pig Iron

Per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

	Per Gross Ton
Domestic, 80% (carload)	$85.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$26.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (ton lots)	85.00
75% (carloads)	126.00
75% (ton lots)	136.00
14% to 16% (f.o.b.) Welland, Ont. (in carloads) (duty paid)	31.00
14% to 16% (less carloads)	38.50

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6%	$22.75	12%	$29.25
7%	23.75	13%	30.75
8%	24.75	14%	32.25
9%	25.75	15%	33.75
10%	26.75	16%	35.25
11%	27.75	17%	36.75

Base prices at Buffalo are $1.25 higher than at Jackson except on 17 to 18% in which the Buffalo price is $1.75 a ton higher.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10%	$27.75	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W, del., carloads	$1.40 to $1.50
Ferrotungsten, less carloads	1.50 to 1.60
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr. per lb. contained Cr. delivered, in carloads	10.00c.
Ferrochromium, 2% carbon	16.50c. to 17.00c.
Ferrochromium, 1% carbon	17.50c. to 18.00c.
Ferrochromium, 0.10% carbon	19.50c. to 20.00c.
Ferrochromium, 0.06% carbon	20.00c. to 20.50c.
Ferrovanadium, del., per lb. contained V	$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace carload and contract per net ton	$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage	50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	$38.00
Ton lots or less, per ton	45.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	90.00
2% carbon grade	95.00
1% carbon grade	105.00
Spot prices	$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	$11.50 to $12.00
No. 2 heavy melting steel	10.50 to 11.00
No. 2 railroad wrought	11.50 to 12.00
Scrap rails	11.50 to 12.00
Rails 3 ft. and under	14.50 to 15.00
Compressed sheet steel	11.00 to 11.50
Hand bundled sheet steel	10.00 to 10.50
Hvy. steel axle turnings	11.00 to 11.50
Machine shop turnings	7.50 to 8.00
Short shov. turnings	7.50 to 8.00
Short mixed borings and turnings	7.00 to 7.50
Cast iron borings	7.00 to 7.50
Cast iron carwheels	11.50 to 12.00
Heavy breakable cast	10.00 to 10.50
No. 1 cast	12.00 to 12.50
Railr. knuckles and couplers	13.75 to 14.25
Rail. coil and leaf springs	13.75 to 14.25
Rolled steel wheels	13.75 to 14.25
Low phos. billet crops	15.00 to 15.50
Low phos. sheet bar crops	14.50 to 15.00
Low phos. plate scrap	13.50 to 14.00
Low phos. punchings	14.00 to 14.50
Steel car axles	14.50 to 15.00

CHICAGO

Delivered Chicago district consumers:

Per Gross Ton	
Heavy melting steel	$9.50 to $10.00
Automobile hvy. melt. steel	8.75 to 9.25
Shoveling steel	9.50 to 10.00
Hydraulic comp. sheets	8.50 to 9.00
Drop forge flashings	7.50 to 8.00
No. 1 busheling	8.00 to 8.50
Rolled carwheels	10.25 to 10.75
Railroad tires	10.25 to 10.75
Railroad leaf springs	10.25 to 10.75
Axle turnings	8.00 to 8.50
Steel couplers and knuckles	10.00 to 10.50
Coil springs	10.25 to 10.75
Axle turnings (elec. fur.)	8.50 to 9.00
Low phos. punchings	10.50 to 11.00
Low phos. plates, 12 in. and under	10.50 to 11.00
Cast iron borings	5.00 to 5.50
Short shoveling turnings	5.00 to 5.50
Machine shop turnings	5.00 to 5.50
Rerolling rails	10.50 to 11.00
Steel rails, less than 3 ft.	10.50 to 11.00
Steel rails, less than 2 ft.	11.00 to 11.50
Angle bars, steel	10.25 to 10.75
Cast iron carwheels	9.75 to 10.25
Railroad malleable	9.75 to 10.25
Agricultural malleable	8.00 to 8.50

Per Net Ton	
Iron car axles	$11.25 to $11.75
Steel car axles	10.50 to 11.00
No. 1 railroad wrought	7.50 to 8.00
No. 2 railroad wrought	8.25 to 8.75
No. 2 busheling	2.75 to 3.25
Locomotive tires, smooth	8.50 to 9.00
Pipe and flues	4.00 to 4.50
No. 1 machinery cast	7.50 to 8.00
Clean automobile cast	7.50 to 8.00
No. 1 railroad cast	7.00 to 7.50
No. 1 agricultural cast	6.00 to 6.50
Stove plate	5.50 to 6.00
Grate bars	5.00 to 5.50
Brake shoes	6.50 to 7.00

PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	$10.50
No. 2 heavy melting steel	9.00
No. 1 railroad wrought	$12.00 to 12.50
Bundled sheets	9.50
Hydraulic compressed, new	10.00
Hydraulic compressed, old	7.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	9.00 to 9.50
Cast borings	5.50 to 6.00
Heavy breakable cast	10.50
Stove plate (steel works)	8.00 to 8.50
No. 1 low phos. heavy	15.00
Couplers and knuckles	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
No. 1 blast furnace	5.50 to 6.00
Spec. iron and steel pipe	8.50 to 9.00
Shafting	15.00 to 16.00
Steel axles	14.50
No. 1 forge fire	9.50
Cast iron car wheels	11.00 to 11.50
No. 1 cast	12.00 to 12.50
Cast borings (chem.)	12.00 to 14.00
Steel rails for rolling	13.00

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$7.25 to $7.75
Scrap rails for melting	8.25 to 8.75
Loose sheet clippings	3.75 to 4.25
Bundled sheets	5.75 to 6.25
Cast iron borings	5.00 to 5.50
Machine shop turnings	4.75 to 5.25
No. 1 busheling	6.25 to 6.75
No. 2 busheling	2.75 to 3.25
Rails for rolling	8.75 to 9.25
No. 1 locomotive tires	8.50 to 9.00
Short rails	11.25 to 11.75
Cast iron carwheels	7.75 to 8.25
No. 1 machinery cast	9.00 to 9.50
No. 1 railroad cast	8.50 to 9.00
Burnt cast	6.00 to 6.50
Stove plate	6.00 to 6.50
Agricultural malleable	8.00 to 8.50
Railroad malleable	8.00 to 8.50

CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	$9.50 to $10.00
No. 2 heavy melting steel	9.00 to 9.50
Compressed sheet steel	9.00 to 9.50
Light bundled sheet stampings	7.25 to 7.50
Drop forge flashings	8.75 to 9.25
Machine shop turnings	7.00 to 7.50
Short shoveling turnings	7.50 to 7.75
No. 1 busheling	8.75 to 9.25
Steel axle turnings	8.25 to 8.75
Low phos. billet crops	13.25 to 13.75
Cast iron borings	7.00 to 7.50
Mixed borings and short turnings	7.00 to 7.50
No. 2 busheling	7.00 to 7.50
No. 1 cast	11.50 to 11.75
Railroad grate bars	7.00 to 7.50
Stove plate	6.50 to 7.00
Rails under 3 ft.	14.50 to 15.00
Rails for rolling	16.00 to 16.50
Railroad malleable	11.50 to 12.00
Cast iron carwheels	10.75 to 11.25

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:	
No. 1 heavy melting steel	$10.50 to $11.00
No. 2 heavy melting scrap	9.00 to 9.50
Scrap rails	10.00 to 10.50
New hydraul. comp. sheets	9.00 to 9.50
Old hydraul. comp. sheets	8.00 to 8.50
Drop forge flashings	9.00 to 9.50
No. 1 busheling	9.00 to 9.50
Hvy. steel axle turnings	7.00 to 7.50
Machine shop turnings	5.00 to 5.50
Knuckles and couplers	11.50 to 12.00
Coil and leaf springs	11.50 to 12.00
Rolled steel wheels	11.50 to 12.00
Low phos. billet crops	12.00 to 12.50
Short shov. steel turnings	6.00 to 6.50
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	6.00 to 6.50
Steel car axles	11.00 to 11.50
Iron axles	11.00 to 11.50
No. 1 machinery cast	10.50 to 11.00
No. 1 cupola cast	8.50 to 9.00
Stove plate	8.50 to 8.75
Steel rails, 3 ft. and under	12.00 to 12.50
Cast iron carwheels	10.50 to 11.00
Industrial malleable	10.50 to 11.00
Railroad malleable	10.50 to 11.00
Chemical borings	7.50 to 8.00

BOSTON

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	$5.75 to $6.25
Scrap T rails	5.75 to 6.25
No. 2 steel	5.00 to 5.25
Breakable cast	6.00 to 6.50
Machine shop turnings	1.75 to 2.00
Bundled skeleton, long	4.00 to 4.25
Forge flashings	4.00 to 4.25
Blast furnace scrap	2.00 to 2.50
Shafting	11.00 to 11.25
Steel car axles	10.50 to 11.00
Cast iron borings, chemical	8.25 to 8.50
Stove plate	6.50
Per gross ton delivered consumers' yards:	
Textile cast	$7.50 to $9.00
No. 1 machinery cast	7.50 to 9.00
Railroad malleable	11.00 to 11.50

NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	*$7.00 †$8.00
No. 2 heavy melting steel	*5.50 to †6.50
Heavy breakable cast	6.75 to 7.25
No. 1 machinery cast	8.00
No. 2 cast	6.25 to 6.75
Stove plate	5.50
Steel car axles	10.75 to 11.50
No. 1 railroad wrought	7.50 to 8.00
No. 1 yard wrought, long	6.50 to 7.00
Spec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rerolling	8.00 to 9.50
Short shoveling turnings	2.50 to 3.00
Machine shop turnings	2.50 to 3.00
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	3.00 to 4.00
Per gross ton, delivered local foundries:	
No. machinery cast	$10.75
No. 1 hvy. cast (cupola size)	9.75
No. 2 cast	8.25

*For direct car loading only.
†Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel	$10.00
Scrap steel rails	9.00
Short shoveling turnings	5.50
Stove plates	$7.00 to 7.50
Steel axles	10.50 to 11.00
Iron axles	10.50 to 11.00
No. 1 railroad wrought	7.00
Rails for rolling	10.50
No. 1 cast	9.00 to 9.50
Tramcar wheels	9.00 to 9.50
Cast iron borings, chem.	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:	
Selected heavy steel	$8.75 to $9.25
No. 1 heavy melting	8.50 to 9.00
No. 2 heavy melting	7.00 to 7.50
No. 1 locomotive tires	9.50 to 10.00
Misc. stand-sec. rails	8.75 to 9.25
Railroad springs	10.25 to 10.75
Bundled sheets	6.75 to 7.25
No. 2 railroad wrought	8.00 to 8.50
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	4.75 to 5.25
Rails for rolling	9.75 to 10.25
Machine shop turnings	4.50 to 5.00
Heavy turnings	5.50 to 6.00
Steel car axles	10.50 to 11.00
Iron car axles	13.00 to 13.50
No. 1 railroad wrought	5.50 to 6.00
Steel rails less than 3 ft.	10.75 to 11.25
Steel angle bars	9.00 to 9.50
Cast iron carwheels	8.00 to 8.50
No. 1 machinery cast	9.00 to 9.50
Railroad malleable	9.00 to 9.50
No. 1 railroad cast	8.50 to 9.00
Stove plate	6.50 to 7.00
Agricult. malleable	9.00 to 9.50

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$7.00 to $7.50
Borings and short turnings	5.00 to 5.50
Long turnings	$4.50 to $4.50
No. 1 machinery cast	9.00 to 9.50
Automotive cast	10.00 to 10.50
Hydraul. comp. sheets	7.00 to 7.50
Stove plate	6.50 to 7.00
New factory busheling	6.00 to 6.50
Old No. 2 busheling	4.25 to 4.75
Sheet clippings	3.50 to 4.00
Flashings	6.00 to 6.50
Low phos. plate scrap	7.50 to 8.00

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$5.50	$5.50
Rails scrap	6.00	4.50
Machine shop turnings	2.50	2.50
Boiler plate	4.50	4.50
Heavy axle turnings	2.50	2.50
Cast borings	3.00	3.00
Steel borings	2.00	2.00
Wrought pipe	2.50	2.50
Steel axles	4.50	6.00
Axles wrought iron	4.50	6.50
No. 1 machinery cast	7.75	9.00
Stove plate	4.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton	
Old range, Bessemer, 51.5% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit	
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	9.50c.
Iron, low phos., Swedish, average 68½% iron	9.50c.
Iron, basic or foundry, Swedish, average, 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron	9c.
Manganese, Caucasian, washed 52%	24c.
Manganese, African, Indian, 44-48%	21c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48½	20c.

Per Net Ton Unit	
Tungsten, Chinese, wolframite, duty paid, delivered*	$18.00 to $18.75
Tungsten, domestic scheelite, delivered†	17.00

Per Gross Ton	
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	$17.00
Chrome, 48% Cr_2O_3, c.i.f. Atlantic Seaboard	20.00

*Quotations nominal in absence of sales.
†Nominal; no supplies available.

Fluorspar

Per Net Ton	
Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines for all-rail shipment	$17.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	18.50
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	$17.50 to 18.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke

Per Net Ton	
Furnace, f.o.b. Connellsville Prompt	$3.85
Furnace, f.o.b. Connellsville Prompt	$4.60 to 5.60
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	$9.35
Foundry, Birmingham	6.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

Per Net Ton	
Mine run steam coal, f.o.b. W. Pa. mines	$1.80 to $2.05
Mine run coking coal f.o.b. W. Pa.	2.05 to 2.25
Gas coal, ¾-in. f.o.b. Pa. mines	2.25 to 2.55
Mine run gas coal, f.o.b. Pa. mines	2.05 to 2.65
Steam slack, f.o.b. W. Pa. mines	1.55 to 1.65
Gas slack, f.o.b. W. Pa. mines	1.90 to 2.10

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.

Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.88c.
No. 5 industrial fuel oil	3.38c.

Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.75c.
No. 4 industrial	5.50c.
No. 5 industrial	4.75c.

REFRACTORIES

Fire Clay Brick

Per 1000 f.o.b. Works	High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	45.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Chrome Brick

Per Net Ton	
Standard size	$45.00

Silica Brick

Per 1000 f.o.b. Works	
Pennsylvania	$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick

Per Net Ton	
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$65.00
Unburned, f.o.b. Baltimore	55.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

Warehouse Prices for Steel Products

PITTSBURGH

	Base per Lb.
Plates	3.20c.
Structural shapes	3.20c.
Soft steel bars and small shapes..	3.00c.
Reinforcing steel bars	3.00c.
Cold-finished and screw stock—	
Rounds and hexagons	*3.45c.
Squares and flats	*3.45c.
Hoops and bands under ¼ in.	3.35c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.55c.
Galv. sheets (No. 24), 25 or more bundles	4.10c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)	$3.32
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count, 65 per cent off list.	
Machine bolts, 100 count, 65 per cent off list.	
Carriage bolts, 100 counts, 65 per cent off list.	
Nuts, all styles, 100 count, 65 per cent off list.	
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb.	*2.70c.
Wire, galv. soft, base per 100 lb.	*2.925c.
Common wire nails, per keg	*2.834c.
Cement coated nails, per keg	*2.834c.

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 9999 lb.

*Delivered in Pittsburgh switching district.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.20c.
Soft steel bars	2.95c.
Cold-fin. steel bars and shafting	
Rounds and hexagons	3.50c.
Flats and squares	3.50c.
Hot-rolled strip	3.30c.
Hot-rolled annealed sheets (No. 24)	3.90c.
Galv. sheets (No. 24)	4.55c.
Hot-rolled sheets (No. 10)	3.05c.
Spikes (9/16 in. and lighter)	3.50c.
Track bolts	4.65c.
Rivets, structural (keg lots)	3.50c.
Rivets, boiler (keg lots)	3.60c.
	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Coach and lag screws	60 and 5
Hot-pressed nuts, sq. tap. or blank	60 and 5
Hot-pressed nuts, hex. tap or blank	60 and 5
Hex. head and cap screws	85
Cup point set screws	70 and 10
Flat head bright wood screws	37½ and 10
Spring cotters	50
Stove bolts in full packages	..70 and 10
Rd. hd. tank rivets, 7/16 in. and smaller	57½
Wrought washers	$5.00 off list
No. 8 black ann'l'd wire per 100 lb.	$3.85
Com. wire nails, base per keg	3.05c.
Cement c't'd nails, base per keg	3.05c.

NEW YORK

	Base per Lb.
Plates, ¼ in. and heavier	3.40c.
Structural shapes	3.37c.
Soft steel bars, small shapes	3.22c.
Iron bars	3.22c.
Iron bars, swed. charcoal	..6.50 to 7.25c.
Cold-fin. shafting and screw stock; Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Cold-roll. strip, soft and quarter hard	3.52c.
Hoops	3.52c.
Bands	3.52c.
Hot-rolled sheets (No. 10)	3.27c.
Hot-rolled ann'l'd sheets (No. 24*)	4.05c.
Galvanized sheets (No. 24*)	4.65c.
Long terne sheets (No. 24)	5.40c.
Standard tool steel	11.00c.
Wire, black annealed (No. 10)	3.30c.
Wire, galv. (No. 10)	3.80c.
Tire steel, 1 x ½ in. and larger,	3.65c.
Open hearth spring steel	.. 4.00c. to 10.00c.
Common wire nails, base, per keg	$3.21
	Per Cent Off List
Machine bolts, cut thread: Up to 1 in. dia. inclusive	60
Over 1 in. dia.	50
Carriage bolts, cut thread: Up to ⅞ in. dia. inclusive	60
Over ⅞ in. dia.	50
	Per 100 Ft.
Boiler tubes: Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

	Base per Lb.
Plates and struc. shapes	3.49c.
Bars, soft steel or iron	3.29c.
Cold-fin. rounds, shafting, screw stock	3.74c.
Hot-rolled annealed sheets (No. 24)	4.34c.
Galv. sheets (No. 24)	4.94c.
Hot-rolled sheets (No. 10)	3.44c.
Black corrug. sheets (No. 24)	4.39c.
*Galv. corrug. sheets	4.49c.
Structural rivets	3.84c.
Boiler rivets	3.94c.
	Per Cent Off List
Tank rivets, 7/16 in. and smaller	55
Machine and carriage bolts, lag screws, fittings up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts 1000 lb. or over	60
200 to 999 lb.	55 and 5
100 to 199 lb.	50 and 5
Less than 100 lb.	50

*No. 26 and lighter take special prices.

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	3.00c.
*Structural shapes	3.00c.
*Soft steel bars, small shapes, iron bars (except bands)	3.00c.
‡Reinforc. steel bars, sq. twisted and deformed	2.955c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.55c.
*Steel bands, No. 12 and 3/16 in., incl.	3.30c.
Spring steel	5.00c.
†Hot-rolled anneal. sheets (No. 24)	3.80c.
†Galvanized sheets (No. 24)	4.40c.
*Hot-rolled annealed sheets (No. 10)	3.20c.
Diam. pat. floor plates, ¼ in.	5.00c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

‡For 50 bundles or over.

‡For less than 2000 lb.

CLEVELAND

	Base per Lb.
Plates and struc. shapes	3.36c.
Soft steel bars	3.05c.
Reinforc. steel bars	*2.10c.
Cold-finished steel bars	3.40c.
Flat-rolled steel under ¼ in.	3.51c.
Cold-finished strip	†3.20c.
Hot-rolled annealed sheets (No. 24)	4.16c.
Galvanized sheets (No. 24)	4.76c.
Hot-rolled sheets (No. 10)	3.26c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets	3.61c.
Black ann'l'd wire, per 100 lb.	$2.65
No. 9 galv. wire, per 100 lb.	3.00
Com. wire nails, base per keg	2.40

*Plus mill, size and quantity extras.

†Outside delivery 10c. less.

CINCINNATI

	Base per Lb.
Plates and struc. shapes	3.45c.
Bars, soft steel or iron	3.25c.
New billet reinforc. bars	3.10c.
Rail steel reinforc. bars	3.10c.
Hoops and bands, 3/16 in. and lighter	3.60c.
Cold-finished bars	3.70c.
Hot-rolled annealed sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Hot-rolled sheets (No. 10)	3.35c.
Structural rivets	4.35c.
Small rivets	55 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 49 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg.	2.95
Chain, 1-in., per 100 lb.	3.35
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.89
4-in.	41.69
Lap-welded steel boiler tubes, 2-in.	16.61
4-in.	38.72

BUFFALO

	Base per Lb.
Plates	3.40c.
Struc. shapes	3.30c.
Soft steel bars	3.10c.
Reinforcing bars	2.10c.
Cold-fin. flats and sq. Round and hex.	3.55c. 3.55c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	4.05c.
Heavy hot-rolled sheets, 3/16 in., 24 to 48 in. wide	3.67c.
Galv. sheets (No. 24)	4.85c.
Bands	3.57c.
Hoops	3.57c.
Hot-rolled unannealed sheets	3.32c.
Com. wire nails, base per keg	$3.00
Black wire, base per 100 lb.	3.45c.

BOSTON

	Per Lb.
Beams, channels, angles, tees, zees	3.42c.
H beams and shapes	3.42c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier	3.43c.
Floor plates, diamond pattern	5.18c.
Bar and bar shapes (mild steel)	3.25c.
Bands 3/16 in. thick and No. 12 ga. incl.	3.50c. to 4.50c.
Half rounds, half ovals, ovals and bevels	4.50c.
Tire steel	4.50c.
Cold-finished rounds and hexagons	3.70c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.20c.
Blue annealed sheets, No. 10 ga.	3.25c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Galvanized steel sheets, No. 24 ga.	4.60c.
Lead coated sheets, No. 24 ga.	5.65c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

PACIFIC COAST

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.55c.	3.70c.	3.55c
Shapes, standard	3.55c.	3.70c.	3.55c.
Soft steel bars	3.60c.	3.70c.	3.55c.
Reinforcing bars	3.50c.	3.50c.	3.50c.
Hot-rolled annealed sheets (No. 24)	4.40c.	4.35c.	4.40c.
Hot-rolled sheets (No. 10)	3.75c.	3.80c.	3.75c.
Galv. sheets (No. 24)	5.00c.	5.05c.	5.00c.
Cold finished steel Rounds	5.95c.	5.95c.	4.75c.
Squares and hexagons	7.20c.	7.30c.	6.00c.
Flats	7.70c.	7.70c.	7.00c.
Common wire nails —base per keg	$3.40	$3.25	$3.35
less carload			

All items subject to differentials for quantity.

New Steel Prices Still Above First And Second Quarter Levels

NEW prices on finished steel products which have been filed with the American Iron and Steel Institute to become effective July 7 and after, represent reductions of $1 to $6 a ton from the figures which have been quoted since early in the second quarter. They are nevertheless $1 to $5 a ton higher than the levels at which most of the tonnage was moved in the first and second quarters. Representative changes are shown in the following table:

Product and Basing Point	First Quarter Price (Cents a Lb.)	Current Quotation (Cents a Lb.)	New Price and Effective Date (Cents a Lb.)	Net Increase Over First Quarter Level (Dollars a Ton)
Soft Steel Bars				
F.o.b. Pittsburgh	1.75c.	1.90c.	1.80c.*	$1
F.o.b. Chicago	1.80c.	1.95c.	1.85c., July 10	1
Plates				
F.o.b. Pittsburgh	1.70c.	1.85c.	1.80c., July 10	2
F.o.b. Chicago	1.75c.	1.90c.	1.85c., July 10	2
F.o.b. Coatesville	1.80c.	1.95c.	1.90c., July 12	2
Shapes				
F.o.b. Pittsburgh	1.70c.	1.85c.	1.80c., July 10	2
F.o.b. Chicago	1.75c.	1.90c.	1.85c., July 10	2
F.o.b. Bethlehem	1.80c.	1.95c.	1.90c., July 12	2
Sheets, Hot-Rolled, No. 10 Gage				
F.o.b. Pittsburgh	1.75c.	2.00c.	1.85c., July 7	2
F.o.b. Gary	1.85c.	2.10c.	1.95c., July 7	2
Sheets, Hot-Rolled Annealed, No. 24 Gage				
F.o.b. Pittsburgh	2.25c.	2.65c.	2.45c., July 7	4
F.o.b. Gary	2.35c.	2.75c.	2.55c., July 7	4
Sheets, Heavy Cold-Rolled, No. 10 Gage				
F.o.b. Pittsburgh	2.30c.	2.55c.	2.50c., July 7	4
F.o.b. Gary	2.40c.	2.65c.	2.60c., July 12	4
Sheets, Heavy Cold-Rolled, No. 10 Gage, Mill Run				
F.o.b. Pittsburgh	2.20c.	2.45c.	2.40c., July 7	4
F.o.b. Gary	2.30c.	2.55c.	2.50c., July 12	4
Sheets, Light Cold-Rolled, No. 20 Gage				
F.o.b. Pittsburgh	2.75c.	3.15c.	2.95c., July 7	4
F.o.b. Gary	2.85c.	3.25c.	3.05c., July 7	4
Sheets, Light Cold-Rolled, No. 20 Gage, Mill Run				
F.o.b. Pittsburgh	2.65c.	3.05c.	2.85c., July 7	4
F.o.b. Gary	2.75c.	3.15c.	2.95c., July 10	4
Sheets, Hot-Rolled, Pickled in the Breakdown, No. 24				
F.o.b. Pittsburgh	2.75c.	3.15c.	2.85c., July 10	2
F.o.b. Gary	2.85c.	3.25c.	2.95c.*	2
Sheets, Galvanized, No. 24 Gage				
F.o.b. Pittsburgh	2.85c.	3.25c.	3.10c., July 10	5
F.o.b. Gary	2.95c.	3.35c.	3.20c., July 10	5
Long Terne Sheets, No. 24, Unassorted				
F.o.b. Pittsburgh	3.25c.	3.65c.	3.45c., July 9	4
Sheets, Porcelain Enameling, No. 20				
F.o.b. Pittsburgh	2.90c.	3.20c.	3.10c., July 9	4
Tin Mill Black Plate				
F.o.b. Pittsburgh	2.65c.	2.85c.	2.75c., July 10	2
Hot-Rolled Strip				
F.o.b. Pittsburgh	1.75c.	2.00c.	1.85c., July 7	2
F.o.b. Chicago	1.85c.	2.10c.	1.95c., July 7	2
Cold-Rolled Strip				
F.o.b. Pittsburgh	2.40c.	2.80c.	2.60c.	4
Alloy Steel Bars				
All Basing Points	2.45c.	2.55c.	2.45c., July 12	..
Blooms, Billets and Slabs				
F.o.b. Pittsburgh	Per Ton $26.00	Per Ton $29.00	Per Ton $27.00, July 10	1
Sheet Bars				
F.o.b. Pittsburgh	26.00	20.00	28.00, July 10	2
Alloy Steel, Ingots				
All Basing Points	49.00	51.00	49.00, July 12	..

*Effective dates are given only when officially announced. It may be assumed that usual differentials between basing points will be maintained.

Consumers Purchase Heavily as Spelter Rises 15 Points—Lead Drops to 3.75c.

Straits Tin Closes Week Slightly Higher as London Pool Buys to Support Market—Copper Unchanged and Inactive

NEW YORK, July 3.—Both the domestic and foreign copper markets are currently in an uninteresting condition. In this country the code price is unchanged at 9c. a lb., delivered Connecticut valley, for electrolytic and arsenical Lake metal, and day-to-day sales are extremely light. There is no outside metal available at a lower level, and the code price is not expected to decline as it probably would in a supply-demand market not supported by NRA regulations. On the contrary, the trade anticipates another advance on the reappearance of a sizable consumptive demand. The code authority has extended the list of consumers which use only Blue Eagle copper. The fabricators now on the list include all the major users of the industry and consequently there would be little outlet for non-Blue Eagle copper if any were offered. Sales abroad are in very small volume, and the market has declined to 7.75c. a lb., c.i.f. Continental ports. The price weakness in Europe is caused mostly by the loss of the German market although the attempts of American and Belgium sellers to secure bookings has exerted some influence.

Tin

Domestic consumers are still almost completely out of the market, but prices have advanced slightly on the strength of buffer pool purchases in London. Straits tin at New York is now 51.37½c. a lb., and London was quoted today on first call at £226 5s. for spot and future standard and £226 15s. for Straits at Singapore. The world tin market has been suffering from the lack of demand from this country. There is little likelihood of this condition being remedied in the near future as tin plate operations are now almost nil and will probably not increase greatly in the next month. However prices may not suffer as pool purchases abroad will probably be made quite frequently during the remainder of the year.

Zinc

A drastic curtailment program and price strength in the Tri-State ore field have been reflected in advances totaling $3 a ton for Prime Western metal. Consumers hastily entered bookings during the rise, and sales last week sharply advanced to 6500 tons of which 2000 tons were for future delivery. This total compared with 4400 tons sold in the previous week and 3200 tons booked two weeks earlier. At the moment the market is quiet and prices are steady at 4.70c. a lb., New York, and 4.35c., East St. Louis, with little probability of additional price strength in the near future. In the Joplin territory the zinc ore market is $2 a ton higher at $27 and $28 for flotation and prime grades respectively. Last week's production was still high at 7600 tons, shipments amounted to 5850 tons, and sales were less than 2500 tons. Stocks now stand at 22,000 tons.

Lead

The discouraging May statistics influenced consumers to go a little short on purchases. Consequently, last week the major seller reduced its price in several stages but there was no response until the quotation reached 3.75c. a lb., New York. This is the lowest level for this metal since last May and users, recognizing a bargain, have been entering heavy bookings for July and August delivery. This activity is additionally enhanced by the slight tendency of the present price toward firmness. The preliminary June statistics indicate shipments of over 27,000 tons, which compares poorly with the heavy May deliveries but about equals the monthly average for the first half of the year. August commitments are comparatively high and July bookings currently are around 20,000 tons. Lead can hardly have a healthy undertone until the present poor statistical trend is reversed. The current low price may discourage the conversion of concentrates until consumption gets more in line with production which would result in a reduction of surplus stocks. The trade now recognizes that such a reduction is becoming more and more necessary.

The Week's Prices. Cents Per Pound for Early Delivery

	June 27	June 28	June 29	June 30	July 2	July 3
Electrolytic copper, N. Y.*‡	8.75	8.75	8.75	8.75	8.75	8.75
Lake copper, Eastern delivery*	9.12½	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, Spot, N. Y.	51.10	51.30	51.12½	....	51.25	51.37½
Zinc, East St. Louis	4.25	4.35	4.35	4.35	4.35	4.35
Zinc, New York	4.60	4.70	4.70	4.70	4.70	4.70
Lead, St. Louis	3.85	3.70	3.60	3.60	3.60	3.60
Lead, New York	4.00	3.85	3.75	3.75	3.75	3.75

*Blue Eagle copper. ‡Refinery; price ¼c. higher in Connecticut Valley.

Quotations below cover wholesale lots, f.o.b. New York.

Aluminum, 98-99 per cent, 22.90c. a lb.
Aluminum, remelt, No. 12 (grade 3), 12.75c. a lb., average for week.
Nickel electrolytic cathode, 35c. a lb.; shot and ingot, remelt electro, 36c. a lb.
Antimony, 7.75c. a lb. Quicksilver, per flask of 76 lb., $75.
Brass ingots, 85-5-5-5, 8.75c. a lb.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	53.00c. to 54.00c.
Tin, bar	55.00c. to 56.00c.
Copper, Lake	10.25c. to 11.00c.
Copper, electrolytic	10.00c. to 10.50c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.50c.
*Seamless brass tubes	17.00c.
*Seamless copper tubes	17.25c.
*Brass rods	13.00c.
Zinc, slabs	5.75c. to 6.75c.
Zinc sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.75c. to 5.75c.
Lead, bar	5.75c. to 6.75c.
Lead, sheets	7.50c.
Antimony, Asiatic	9.75c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	32.50c. to 33.50c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	54.25c
Tin, bar	56.25c.
Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slab	5.75c. to 6.00c.
Lead, American pig	4.75c. to 5.00c.
Lead, bar	7.75c.
Antimony, Asiatic	9.00c.
Babbitt metal, medium grade	18.50c.
Babbitt metal, high grade	58.25c.
Solder, ½ and ½	33.00c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.62½c.	7.37½c.
Copper, hvy. and wire	6.37½c.	7.12½c.
Copper, light and bottoms	5.37½c.	6.37½c.
Brass, heavy	3.37½c.	4.00c.
Brass, light	3.00c.	3.62½c.
Hvy. machine composition	5.12½c.	6.00c.
No. 1 yel. brass turnings	4.50c.	5.25c.
No. 1 red brass or compos. turnings	4.37½c.	5.37½c.
Lead, heavy	3.00c.	3.50c.
Zinc	2.25c.	3.00c.
Cast aluminum	9.62½c.	10.75c.
Sheet aluminum	11.00c.	12.50c.

Non-Ferrous Averages

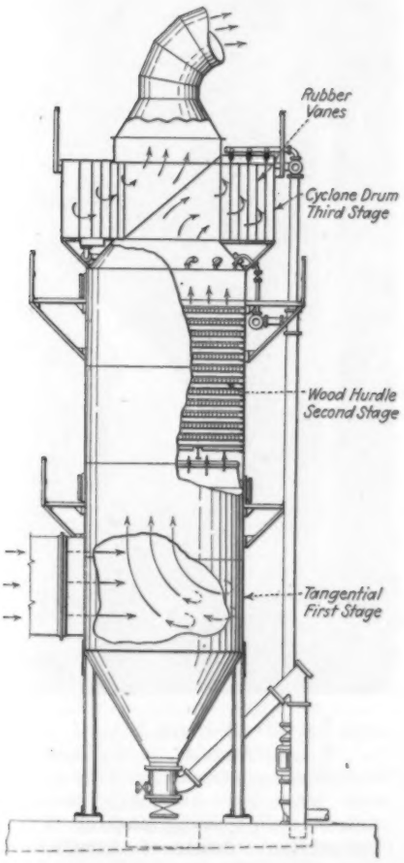
THE average prices of the major non-ferrous metals for June, based on daily quotations in THE IRON AGE, are as follows:

	Average
Electrolytic copper, N. Y.*‡	8.57c. a lb.
Lake copper, Eastern delivery*	8.95c. a lb.
Straits tin, Spot, N. Y.	51.31c. a lb.
Zinc, East St. Louis	4.24c. a lb.
Zinc, New York	4.59c. a lb.
Lead, St. Louis	3.83c. a lb.
Lead, New York	3.98c. a lb.

*Blue Eagle copper. ‡Price ¼c. higher in Connecticut.

Three-Zone Static Washer for Blast Furnace Gas

MULTI-ZONE static gas washers are a new development by Freyn Engineering Co., Chicago. Gas is passed through three zones. The first removes the heavier particles by utilizing the action of centrifugal force caused by whirling the gas at the base of the washer. The second zone utilizes wetted wooden hurdles to wet the gas and remove more of its dust content. The third zone removes the fine dust left after the first two stages as well as most of the water content



A Freyn-Design static gas washer for handling 80,000 cu. ft. of gas per min. used water at a rate under 18 gal. per 1000 cu. ft. and cleaned the gas to 0.15 gr. of dust per cu. ft.

in the gas by an effect obtained through passing the gas over wet rubber surfaces.

The principle of contact and impact with wetted surfaces is used throughout. Turbulence is regarded as the essential factor in securing complete and intimate surface contact. The resulting impact is depended on as necessary to break through surface tension. Turbulence is thus intentionally induced in each zone of the washer by the arrangement of passages and by reasonably high velocities.

In the first zone of the gas washer, the gas enters tangentially near the bottom. The heavier dust particles are thrown centrifugally against the shell, where they are entrapped in a water film thereon, and carried to the collector cone at the bottom of the washer. This film of water is caused to flow over the shell from the distributor box below the hurdles.

In the second zone the gas is passed through wetted wooden hurdles. Great turbulence is induced (1) by staggering the vertical alinement of the hurdle slats; (2) by leaving free spaces across the washer horizontally between successive courses of hurdles; and (3) by causing the gas to flow through the hurdle openings at a velocity exceeding the critical velocity which causes the gas stream to roll and acquire turbulence.

The third zone of the washer is

found to remove 85 to 90 per cent of the dust remaining after the first two stages. Entrained moisture is removed in the cyclone drum. The efficiency of dust removal, it is believed, is in great measure due to the intentionally high moisture entrainment in the gas entering this third stage, and is manifested in the resulting low entrainment in the exit of gas. Water, it may be said, "takes" readily on a rubber surface; that is, rubber has a high surface affinity for water. The rubber vanes are therefore readily kept wet and afford ideal surfaces for the lodgment of the dust particles. Moreover, most of the dust particles are enveloped in water drops from the spray nozzles. Their buoyancy is reduced, which causes them to travel the more readily in the radial direction toward the wet rubber surfaces of the vanes. Once in contact with these wet surfaces, the dust particles and the entrained water drops are definitely removed from the gas stream. This third zone cyclone drum is thus described as a cleaner as well as a drier.

Water nozzles are accessible from the exterior of the washer and can be conveniently removed for cleaning in case of damage to the twin basket strainer on the main water supply line.

A multi-zone static gas washer, 12 ft. in diameter and 51 ft. high, is rated at 80,000 cu. ft. of gas per min. (at standard conditions). Using water at a rate less than 18 gal. per 1000 cu. ft. of gas cleaned, and requiring a water pressure of only 30 lb. per sq. in., the multi-zone washer is found to clean blast furnace gas to 0.15 gr. of dust per cu. ft. The entrained moisture in the cleaned gas is low, being less than 1 gr. per cu. ft. of gas. The multi-zone washer requires no mechanical power and has no moving parts. The pressure drop through the washer is less than 6 in. of water.

The initial investment cost is emphasized as low, with low operating costs, because it is economical of water. The new gas washer, known as the Freyn-Design multi-zone static gas washer, may be erected as a complete installation, or existing static towers may be modified to incorporate the improvement of the Freyn-Design washer.

No Government Boycott Against Weirton

WASHINGTON, July 3.—Denial was made today by Department of Justice officials associated with the Weirton Steel Co. case of any knowledge of a boycott threat by the Government against the company. The statement was based on developments at arguments in the court case in Wilmington, Del. No statement was forthcoming from the NRA in the absence from Washington of Administrator Hugh S. Johnson.

H. O. Swoboda, Inc., Pittsburgh, manufacturer of Falcon continuous electric heat-treating furnaces, electric immersion heaters, and special industrial heating equipment, has announced appointment of C. W. Piper, 2033 Maple Avenue, Norwood, Ohio, as sales representative in the southern Ohio and eastern Indiana territory.

Thirteen One-Half Miles Of Automatic Welding

AUTOMATIC arc welding produced 13½ miles of longitudinal seams in the fabrication of the pipe sections for one of the largest water lines in the West, a 4½-mile pipe line connecting Bouquet Canyon Dam with San Francisquito Power House No. 1 on the line of the Owens Valley aqueduct, about 50 miles from Los Angeles. This pipe varies in size from 80 to 94 in. in diameter with wall thicknesses of 1 1/16 in. down to ⅜ in.

The pipe sections were manufac-

tured by the Western Pipe & Steel Co. of Los Angeles, using General Electric automatic arc-welding equipment with two automatic welding heads on each welding machine. Each pipe section consists of three rolled plates with three welded longitudinal seams. The heavier sections, 80 in. in diameter with a wall thickness of 1 1/16 in., were made in 20-ft. lengths weighing 12 tons. The 86- and 94-in. sections, with wall thicknesses of 1 in. and ⅜ in. respectively, were made in 30-ft. lengths.

Much of this pipe line runs up and down over 45-deg. slopes, and at one dip in the line the pipe will operate under a head of 820 ft.; approximately 400 lb. per sq. in. It is at this point that the heaviest pipe section is used.

Valley Production Schedules Sharply Curtailed—Future Prospects Uncertain

YOUNGSTOWN, July 3.—Holiday interruptions, lack of third quarter backlogs and the expected seasonal lull have caused sharp curtailment in steel output at Valley mills. Producers here are resigned, however, to the prospect of a dull month after the unusually active period in May and June, when operations soared to the highest level in several years.

In the current week, several mills will be shut down on Independence Day, while some units closed down entirely from July 1 through the holiday. This pause is welcome to some producers, whose operations toward the close of second quarter had been taxed to a point where a recess was advisable for checking up inventories of raw materials and of finished products. For the most part, operating schedules for the early weeks in July will rely chiefly on production orders for replenishing depleted stocks of semi-finished and finished grades of steel. The meager tonnage of third quarter steel on producers' books will be of little help to early producing schedules. Some assistance, of course, will come from backlogs of structural steel, pipe for public works projects, rails and track accessories, which were not governed by shipping provisions at the close of second quarter.

Prospects for Third Quarter

Prospects for third quarter business still are very obscure. Some unsettlement has been added to the general uncertainty by the filing of price reductions on bars, hot-rolled strip and sheets at Pittsburgh and Gary. The reductions, ranging from $1 to $4, will become effective July 7. Valley producers will probably follow suit in order to remain on a competitive basis. The first effects of reduced quotations will undoubtedly be to defer some consumer covering until all prices indicate establishment on at least a temporarily firm basis. The price advances announced in second quarter have been practically nominal, and very little, if any, business at the higher prices has been booked. The protection of consumers against higher prices under the new steel code has defeated the urge to cover ahead, and contracting during third quarter is not expected to fluctuate as sharply as in periods where prices faced higher levels.

As in steel, Valley pig iron makers report very thin order books for the current quarter. The same protection against higher pig iron prices in the quarter that applies to steel products suggests that pig iron buying will be predicated largely upon existing melting needs. Very few carryovers of second quarter tonnage were reported. In the exceptional instances where last quarter's tonnage was not fully released by the consumer, new contracts were written for third quarter to cover the unshipped quantity.

Scrap is stationary and faces a month of low open-hearth activity. Consumer inventories are conceded to be unusually low. However, it is almost certain that restricted activity will continue at practically all consuming points in the Valleys, with a pick-up not generally predicted until August. It would be surprising to find a buying movement in July sufficient in scope to support present price levels. If the present resistance of most dealers, however, to sales at bargain prices continues, the course of scrap values may not succumb entirely to the unfavorable influences that are already in sight for July.

The Struthers Iron & Steel Co. was recently successful in its petition for a rate of $6.30 a car on coke between the Youngstown Sheet & Tube Co. mill at Youngstown and the Struthers company plant at Struthers. The granting of the rate by the State Utilities Commission was based largely on the fact that the Youngstown Sheet & Tube Co. has been conveying coke from Youngstown to its emergency stock piles at Struthers on the same rate.

Fabricated Structural Steel

Lettings Slightly Higher—New Projects Decline

AWARDS of 10,550 tons compare with 8700 tons last week and 28,000 tons two weeks ago. A steel mill addition at Detroit requiring 1400 tons, and a bridge at Belleville, Ill., requiring 1020 tons, are the only awards of size. New projects of 8950 tons are mostly for small tonnages and compare with 26,750 tons in the previous week. An inspection shed for the City of New York and a high school at Jamestown, N. Y., each calling for 1000 tons, are the largest new jobs reported. Plate awards total more than 2300 tons. Structural steel contracts in June totaled 82,725 tons, compared with 87,350 tons in May, and for the first six months this year totaled 426,320 tons. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Medway, Me., 185 tons, bridge, to Lackawanna Steel Construction Corpn.

Westboro, Mass., 180 tons, State hospital, to Bethlehem Fabricators, Inc.

Bridgeport, Conn., 125 tons, industrial building, to Bethlehem Fabricators, Inc.

Staten Island, N. Y., 250 tons, warehouse for Procter & Gamble Co., to Pittsburgh Bridge & Iron Co.

Niagara Falls, N. Y., 225 tons, industrial building, to R. S. McMannus Steel Construction Co.

Peekskill, N. Y., 380 tons, building for Standard Brands, Inc., to American Bridge Co.

Saratoga Springs, N. Y., 345 tons, bath houses to Shippers Container Corpn.

Grasselli, N. J., 900 tons, building, to Belmont Iron Works.

Philadelphia, Pa., 165 tons, turbine house, to Belmont Iron Works.

State of Pennsylvania, 200 tons, girder spans, to American Bridge Co.

Janney, Pa., 770 tons, State highway bridge, to McClintic-Marshall Corpn.

Sharpsburg, Pa., 300 tons, stock house for Fort Pitt Brewing Co., to Fort Pitt Bridge Works Co.

Wilmerding, Pa., 200 tons, boiler house for Westinghouse Air Brake Co., to McClintic-Marshall Corpn.

Pittsburgh & West Virginia Railroad, 190 tons, bridge at Suydam, Pa., to American Bridge Co.

THE SOUTHWEST

Ada, Okla., 200 tons, addition to cement plant, to J. B. Klein Iron & Foundry Co.

CENTRAL STATES

Wellston, Mich., 800 tons, bridge over Manistee River, to Wisconsin Bridge & Iron Co.

Dupo, Ill., 170 tons, bridge for Missouri Pacific Railroad, to Stupp Brothers Bridge & Iron Co.

Marwell, Ill., 650 tons, State highway bridge, to Mississippi Valley Structural Steel Co.

Belleville, Ill., 1020 tons, highway bridge, to Midland Structural Steel Co.

Duluth, Missabe & Northern Railroad, 140 tons, ore car repair material, to American Bridge Co.

Fairport, Ohio, 1000 tons, sheet steel piling for Government breakwater divided among Carnegie Steel Co., Bethlehem Steel Co. and Jones & Laughlin Steel Corpn.

Kansas City, Mo., 800 tons, Winner Road viaduct to Kansas City, Structural Steel Co.

WESTERN STATES

Southern Pacific Co., 190 tons, bridge at Truckee, Cal., to Virginia Bridge & Iron Co.

Southern Pacific Co., 200 tons, bridge at Gaviota, Cal., to McClintic-Marshall Corpn.

Southern Pacific Co., 200 tons, bridge at Lento, to McClintic-Marshall Corpn.

Los Angeles, 340 tons, chemistry building addition at University of California at Los Angeles, to Pacific Coast Steel Corpn.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Littleton, N. H., 400 tons, State bridge.

Boston, 175 tons, hospital unit.

New York, 1000 tons, city inspection shed and service building.

Jamestown, N. Y., 1000 tons, high school building.

Rome, N. Y., 200 tons, building for Rome Brass & Copper Co.

Newark, N. J., 900 tons, apartment house for Prudential Life Insurance Co.

Reading, Pa., 400 tons, junior high school.

Golden Ring, Md., 540 tons, State highway bridge.

SOUTH AND SOUTHWEST

Quantico, Va., 150 tons, Government batchelor quarters.

Shawnee, Okla., 250 tons, bridge.

Macon, Miss., 200 tons, bridge.

CENTRAL STATES

Sault Ste. Marie, Mich., 800 tons, Ashmun Street bridge; Fry & Kain, Inc., and Robert Hudson, Lansing, Mich., contractor.

Columbus, Ohio, 350 tons, east wing of City Hall.

Lemont, Ill., 1000 tons, bridge over Sanitary District ship and drainage canal; McClintic-Marshall Corpn. low bidder.

Lemont, Ill., 1000 tons, bridge over Calumet and Sag channel; McClintic-Marshall Corpn. low bidder.

Lake Forest, Ill., 600 tons, high school.

Sheboygan, Wis., 150 tons, Fourteenth Street overhead bridge; bids July 11.

Jordan, Minn., 230 tons, State highway bridge.

Muscatine, Iowa, 310 tons, bridge.

Pulaski and Douglas Counties, Mo., 350 tons, bridges.

WESTERN STATES

Missoula, Mont., 175 tons, students' residence, Montana University.

Fort Peck, Mont., 350 tons, pipe connecting link for dredges.

Catron County, Colo., 100 tons, bridge for Bureau of Public Roads; bids July 6.

Sacramento, Cal., 2035 tons, M Street bridge; George Pollock Co. low bidder on general contract.

San Jose, Cal., 750 tons, city auditorium; bids were rejected and job will be readvertised.

San Jose, Cal., 500 tons, bridge.

FABRICATED PLATE

AWARDS

Worcester, Mass., 125 tons, standpipe for State hospital, to Chicago Bridge & Iron Works.

Sharpsburg, Pa., 300 tons, beer tanks, 190 tons to Blaw-Knox Co.; 110 tons to Treadwell Engineering Co.

Oceanside, N. Y., 335 tons, tanks, to Chicago Bridge & Iron Works.

Destrehan, La., 165 tons, four tank roofs for Pan American Petroleum & Transportation Co., to Chicago Bridge & Iron Works.

Whiting, Ind., 800 tons, tanks for Carbide & Carbon Chemical Corpn., to Graver Tank & Mfg. Corpn.

Midland, Mich., 400 tons, tanks for Dow Chemical Co., to Graver Tank & Mfg. Corpn.

Two Rivers, Wis., 200 tons, 500,000-gal. elevated steel tank, to Pittsburgh-Des Moines Steel Co.

NEW PROJECTS

Wyandotte, Mich., 200 tons, municipal water tank.

Fort Peck, Mont., 150 tons, pipe line; bids July 16.

Los Angeles, 1025 tons, gates for Parker Dam; bids July 26.

Reinforcing Steel

Awards 2150 Tons—New Projects 3675 Tons

Newton, Mass., 100 tons, high school, to Morrison & Stevens, Boston.

Johnson City, N. Y., 100 tons, school, to Truscon Steel Co.

Worcester, Mass., unstated tonnage, to Merrill & Usher Co., Worcester.

Champaign, Ill., 170 tons, to Concrete Engineering Co.

State of Illinois, 100 tons, State road work, to Concrete Engineering Co.

Boise, Idaho, 130 tons, State paving, to an unnamed bidder.

Bonneville County, Idaho, 125 tons, State subway, to Pacific Coast Steel Corpn.

Colton, Cal., 145 tons, city reservoir, to Pacific Coast Steel Corpn.

San Diego, Cal., 260 tons, El Capitan reservoir, to Soule Steel Co.

Los Angeles, 490 tons, two bridges on Gaffey Avenue and tunnel station bridge, to Concrete Engineering Co.

Los Angeles, 230 tons, paving to Soule Steel Co.

Los Angeles, 100 tons, widening Western Avenue viaduct, to Soule Steel Co.

Alhambra, Cal., 100 tons, post office, to Truscon Steel Co.

Hollywood, Cal., 100 tons, Kress store, to Soule Steel Co.

NEW REINFORCING BAR PROJECTS

Lemont, Ill., 287 tons, bridge over Sanitary District ship and drainage canal; bids taken June 26.

Lemont, Ill., 165 tons, bridge over Calumet and Sag channel; bids taken June 26.

Maywood, Ill., 170 tons, reservoir; bids taken.

Chicago, 800 tons, sewer project No. 9 for Sanitary District; general contract awarded to Paschen Brothers, Inc., Chicago.

Fulton County, Ill., 100 tons, State bridge.

Moline, Ill., 375 tons, approach to bridge across Mississippi River.

Sheffield, Ala., 1500 tons, miscellaneous needs of Tennessee Valley Authority; direct bids taken from reinforcing bar distributors June 30.

Sheboygan, Wis., 225 tons, Fourteenth Street overhead; bids July 11.

San Jose, Cal., 300 tons, city auditorium; all bids rejected and job will be readvertised.

San Francisco, 100 tons, Calaveras aerator; bids July 6.

San Bernardino County, Cal., 140 tons, State storm drain; bids July 19.

Los Angeles, 140 tons, chemistry building addition at University of California; general contract awarded.

Los Angeles, 100 tons, addition to I. Magnin's, general contract awarded.

Huntington Beach, Cal., 275 tons, elementary school; general contract awarded.

Altadena, Cal., 100 tons, Jackson School; bids July 26.

Cast Iron Pipe

Bethel, N. H., has closed bids on 20,000 ft. of 6 and 8-in. R. D. Wood & Co. is low bidder.

Clarence, Mo., asks bids until July 12 for 44,300 ft. of 2 to 8-in. for new water supply system, also for 75,000-gal. elevated steel tank on 125-ft. tower. J. W. Shikles & Co., New York Life Building, Kansas City, Mo., are consulting engineers.

Phoenix, Ariz., will take bids soon for about 15 miles of 2 to 12-in. for water supply. Fund of $100,000 has been arranged for this and other waterworks construction. W. C. Lefebvre is city manager.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 17 for cast iron soil and water pipe (Schedule 2834) for Eastern and Western Navy Yards.

Mount Ida, Ark., closed bids July 5 for quantity of 2 to 6-in. for water system. F. A. Pritchett, Wallace Building, Little Rock, Ark., is consulting engineer.

Williamston, S. C., asks bids until July 17 for 19,600 ft. of 6 and 8-in. for main water lines; 17,100 ft. of 1, 1½ and 2-in. galvanized pipe for distribution lines; 1812 ft. of 6 to 12-in. cast iron pipe for sewage collection system; about 14,000 lb. fittings; 75,000-gal. elevated tank and tower, centrifugal pumping unit and accessories. Harwood Beebe Co., Spartanburg, S. C., is consulting engineer.

Torrance, Cal., plans early call for bids for 127,525 ft. of 4 to 16-in. for water lines; also for elevated steel pressure tank, 250,000-gal. capacity, on 150 ft. steel tower, pumping machinery, water meters, etc., for water system. Bond issue of $400,000 is being arranged. Frank Leonard is city engineer.

Auburn, Ky., asks bids until July 9 for 4 and 6-in. for water system, 3 to ¾-in. galvanized steel pipe for distribution lines, 60,000-gal. capacity elevated steel tank and tower. Fund of $43,000 has been arranged. Robert & Co., Inc., Bona Allen Building, Atlanta, Ga., is consulting engineer.

San Francisco has awarded 5700 tons to United States Cast Iron Pipe Co., 2100 tons to National Cast Iron Pipe Co., and 1500 tons to American Cast Iron Pipe Co.

Whittier, Cal., has awarded 256 tons to National Cast Iron Pipe Co.

South Pasadena, Cal., let 160 tons to United States Cast Iron Pipe Co.

Santa Monica, Cal., has taken bids on 148 tons of 4 and 6-in.

Bureau of Reclamation will take bids July 2 at Spokane, Wash., on 224 tons for a water system at Grand Coulee dam.

Madison, Wis., has awarded 700 tons to Central Foundry Co.

Detroit Scrap Market Weak

DETROIT, July 3.—The local scrap market is continuing to show signs of weakness. However dealers are confident that the bottom has been reached and consequently are accumulating whatever stocks they can at current levels to hold for higher prices. Purchases by consumers are practically at a standstill. Dealers are anticipating early resumption of boat shipments to Cleveland which have been held up for more than a month.

Railroad Equipment

Purchasing Agent, Panama Canal, has placed 725 tons of steel rails each with United States Steel Products Co., and Bethlehem Steel Co., and has bought about $11,000 worth of rail fastenings from United States Steel Products Co.

Steel Warehouse Men Discuss Problems Of Codification—Business Improved

(Concluded from Page 35)

eign steel revealed the fact that up until about two months ago sales of imported steel along the Atlantic Seaboard had been negligible. At that time, however, a distinct increase had been noticed and recent estimates had placed foreign steel sales in the New York metropolitan district at as much as 80 per cent of the warehouse total. It was pointed out that New York importers were able to sell comparatively large tonnages of foreign steel to jobbers in nearby Coast cities, thus encouraging importations. The favorable exchange rate, together with the recent agitation at Washington to encourage war debt payment in goods, was mentioned as favoring this movement.

Committee Reports

Of particular significance among the various committee reports was that of Ralph J. Stayman, Jones & Laughlin Steel Corpn., Pittsburgh, on cutting extras. He explained that a new schedule of cutting extras which would be uniform in all details and at the same time would be fair to all concerned was very difficult to formulate. Such a schedule, however, is being arranged with simplification as its principal aim. It will be submitted to the entire association at an early date and later group meetings will be held at which members will have an opportunity to reconcile their ideas on the subject.

A protest against mill schedules on tool steel was registered. It was admitted, however, that some changes had already been made and that revision in schedules which would permit warehouses to earn a fair profit might be expected in the near future.

The report of the sheet steel committee was not so encouraging. It was pointed out that differences between the ideas of the National Association of Sheet Metal Distributers and those of the warehouse association had been difficult to reconcile. Sales of sheets out of warehouse have been placed under a division of the general warehousing code. Recent cooperation with the mills, however, has brought favorable results.

St. Louis Foundry Operations Drop

ST. LOUIS, July 3—The beginning of the third quarter finds makers of pig iron with virtually no orders for material for delivery during this period. Prices may not be advanced during the quarter and it is possible that they may be lowered, and therefore there is no incentive for placing contracts at this time. Melters who could finance their purchases, took all the iron they had contracted for shipment during second quarter. June shipments were the heaviest of the year, which is another reason why the movement during July and most of August will be light. There is very little spot business.

Because of the extreme heat prevailing in the district during the week, foundries averaged about three days a week, and the heat and the Independence Day holiday are expected to cause a curtailment again this week. Some of the larger melters in the district are said to be planning to close down to enable their employees to take a week's vacation, the heat now prevailing being a factor in their decision.

Conditions in the finished iron and steel trade are quiet, following several weeks of heavy specifications against contracts which expired last Saturday. There are few inquiries before the market, and July is expected to be quiet. Warehouse prices on sheets have been advanced 40c. a 100 lb. effective July 1, factors here not having followed the general advance that was established by mills some time ago. From present indications, it is stated by operators here, that warehouse prices may be expected to hold during the third quarter.

The United States Engineer's Office, Kansas City, Mo., will open bids on July 9 for 15,000 tons of steel sheet piling to be used in the construction of a dam at Fort Peck, Mont. This is said to be the largest tonnage of this material ever required for one project. The Midland Structural Steel Co. has been awarded 1019 tons for a highway bridge at Belleville, Ill. A highway bridge in Butler County (Mo.) has been awarded to Stupp Brothers Bridge & Iron Co.

Scrap

Prices of scrap iron are nominal, there having been no sale of consequence in several weeks to establish the market. Mills are said to be waiting for orders for finished products before making further commitments. The extreme heat, and the low prices prevailing have virtually stopped the movement of scrap from the country districts. The list of the St. Louis-San Francisco Railway, approximately 7000 tons, was sold last Friday, mostly for export.

Hoffmann & Billings Mfg. Co., Milwaukee, a pioneer in the development and manufacture of plumbing fixtures, notably shower baths, hospital fittings and shower stalls, has disposed of its entire line, including production equipment, to the Kohler Co., Kohler, Wis., and will discontinue business.

Electrolytic Treatment Increases Corrosion Resistance of Metals

A VEXING problem in the corrosion of metals, particularly in the case of some of the stainless steels, is claimed to have been solved, or at least greatly simplified, by a process developed by Dr. Colin G. Fink and F. J. Kenny of Columbia University, New York. The process is described in a recent patent (U. S. 1,961,752 — June 5, 1934). Primarily the results are said to be an improvement in the corrosion resistivity of these steels and other alloys.

The process as developed has as its aim the "equipotentializing" of the surface or surface portions of these materials. Not only is the resistivity, as evaluated in terms of grams loss per unit area, greatly increased but, even more important, the uniformity of the resistivity over the whole area is claimed to be greatly improved. By the term metal is meant "metals in which the difference of potential between different parts of the surface exist."

Those metals or alloys which form or have formed on them adherent oxide films, having an expansion characteristic nearly the same as that of the metal or alloy itself, are, according to one accepted theory, those which are most resistant to corrosion. If the surface or surface portion of these metals and alloys can be equipotentialized, the resistance thereof to corrosion, say the patentees, should be increased. This can be accomplished, they say, by electrolytic treatment. By "equipotentializing" is meant a procedure by which "the electropotential of two or more parts, constituents, areas or points become equalized."

Electrolytic Bath Used

The treatment is carried out by immersing the metal or alloy article to be treated in an electrolytic bath, connecting it in the electric circuit and dissolving a portion of its surface with the current. Points or areas of high electrolytic potential will dissolve more rapidly or preferentially and, as the current is allowed to act, a time is reached when points or areas of high anodic potential have been substantially eliminated and the surface as a whole equipotentialized.

As an example of the effect of the new treatment—a commercially annealed sheet of 18 and 8 chromium-nickel alloy steel is taken. Such a sheet is hung as an anode in a tank containing a solution of chromic acid. As the current flows, the surface or surface portions of the sheet are dissolved, thus reducing or substantially eliminating the points or areas of high anodic potential and equipotentializing the surface. The surface of the sheet is at the same time oxidized or passivated. At the end of a suitable period of such electrolytic treatment, the sheet is taken out and preferably washed with water and dried.

The cathodes in the bath are lead, or 18 and 8 steel, or some suitable material. The concentration of the chromic acid is suggested as 42.5 per cent, the temperature of the bath as 40 deg. Cent., the current density as 0.06 and the time one hour.

Loss of Weight by Corrosion

As between two samples of the same 18 and 8 alloy, one treated and the other not treated, the relative loss in weight between the two was as 13 to 1, that is, the untreated piece lost 13 times as much as the one treated, both after being subjected to 100 hours of corrosion in a 10 per cent solution of ferric chloride.

The average loss per unit area of the two pieces was as 11.8 to 1, that is, the nickel-chromium stainless steel, treated by the new electrolytic method and tested, turned out to be 12 times as resistant to corrosion as the untreated metal, on a weight loss basis. Samples submitted to atmospheric corrosion indicated a similar relation of corrosion resistivity.

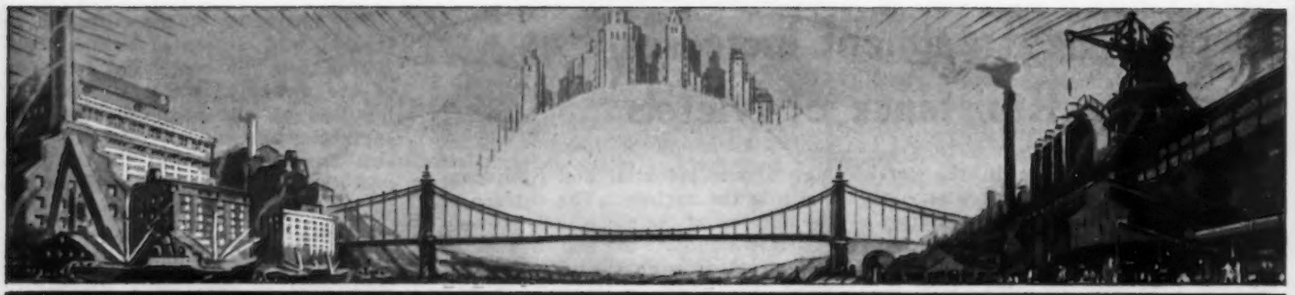
The character of the corrosion in treated and untreated samples appeared to be different. The corrosion of the untreated metal was usually localized or pitted and beneath the surface, while the corrosion of articles treated according to the new process was substantially uniform and at the surface.

Of importance also is the claim that corrosion along grain boundaries is eliminated or materially diminished by the new treatment.

It is also claimed that an appreciable increase in the resistivity of alloy and metal articles to corrosion has been obtained by the new process when applied to Monel metal, sheet iron and brass.

New Way to Make Hollow Drill Steel

A NEW method of making hollow drill steel is a feature of rolling mill operations in Sweden. As against the conventional process of drilling a hole in the billet and then filling this with sand previous to rolling, the Swedes are inserting a rod of austenitic steel in the hole. When the billet is rolled with this rod in it, so proportioned as to make the hollow drill steel correct as to its hollowness, the rod reduces the same as the billet, but it is easily withdrawn from the finished product. In addition, it is said there is much less difficulty in maintaining the concentricity of the hole.



PLANT EXPANSION AND EQUIPMENT BUYING

Large Machine Tool Order Placed At Detroit—Business Slightly Better

A DETROIT company which has just been organized to manufacture tools and fixtures has placed orders for about 25 machine tools, including lathes, shapers, horizontal boring mills, milling and drilling machines and grinders. Business otherwise is rather quiet, although a few makers report slightly heavier inquiry. A Chicago maker of industrial sewing machines may soon purchase tools to extend its field to domestic units.

Exports are quiet and no new buying of consequence has been reported. Significant purchases by the automobile industry are still deferred and no action is expected before at least another month.

◀ NORTH ATLANTIC ▶

Standard Oil Co. of New York, 26 Broadway, New York, has let contract to General Contracting & Engineering Co., 40 Rector Street, for dredging in Staten Island Sound and other work in connection with new bulk oil storage and distribution plant at Kreischerville, S. I. Steel tanks, pumping plant, pipe lines, etc., will be installed. Cost about $700,000 with equipment. C. A. Ellis is chief engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 13 for steam and water drums and headers (Schedule 2822) for Brooklyn and Charleston, S. C., Navy yards; 1600 loop antenna suspension insulators and 1600 sets hardware (Schedule 2816) for Brooklyn and Mare Island yards; steel forgings for shafting (Schedule 2825) for Brooklyn and Philadelphia yards; 550 shower heads (Schedule 2836) for Brooklyn and Sewall's Point yards.

Western Gateway Roofing & Metal Works, Inc., Schenectady, N. Y., has been organized by Richard Daddario, 2340 Story Avenue, Niskayuna, N. Y., and Carl Veglia, 68 Fifth Avenue, Scotia, N. Y., to manufacture metal roofing and kindred metal products.

Colonial Beacon Oil Co., 155 East Forty-fourth Street, New York, will ask bids in about 60 days for new bulk oil storage and distributing plant at Brooklyn. Cost about $100,000 with tanks and other equipment. C. L. Paul, address noted, is company engineer.

Superintendent of Lighthouses, St. George, Staten Island, New York, asks bids until July 12 for converting lighthouse tender from coal to oil-burning, including installation of fuel oil tanks, oil burners, heaters, pumps and auxiliary equipment (Proposal 44612).

Duralloys, Inc., New York, has been organized by Herman D. Olson, 109-70 205th Street, and Rass M. Rainey, 119-39 197th Street, both St. Albans, N. Y., to manufacture metal and metal alloy castings and operate a general foundry and machine shop.

Potrero Sugar Co., 120 Wall Street, New York, with sugar mill at Bayamon, Puerto Rico, plans new distilling plant at last noted place for production of rum and other liquors. Cost about $100,000 with equipment.

National Distillers Products Corpn., 52 William Street, New York, is arranging for increase in capital from 2,488,761 to 3,000,000 shares of stock, majority of new stock to be sold for additional operating capital of $16,850,000. Of such amount, 337,000 shares will be acquired by Distillers Co., Ltd., London, England, which has organized American interest under name of Distillers Co., Ltd. (of Delaware), to operate a group of subsidiaries for production of gin and other liquors under formulas of British organization. Plants will be established in different parts of country by Delaware company, and work on several such units has begun, initial investment in distilleries and equipment to total over $1,000,000. National Distillers Products Corpn. will purchase a substantial interest in Delaware organization.

Sylvania Industrial Corpn., 122 East Forty-second Street, New York, manufacturer of transparent cellulose paper products, plans early rebuilding of part of mill at Fredericksburg, Va., recently destroyed by fire, with loss over $150,000 including equipment.

Philip Kempler Co., Inc., Newburgh, N. Y., has been organized by Philip Kempler, 375 Carpenter Avenue, and Abraham L. Kempler, 48 Carson Avenue, both Newburgh, to manufacture sheet metal products.

Tenney Engineering, Inc., 49 Dickerson Street, Newark, N. J., manufacturer of mechanical equipment, has removed plant to building recently leased at Bloomfield Avenue and Grove Street, Bloomfield, N. J., about 5000 sq. ft. floor space, and will carry out expansion for manufacture of heaters, air-cooling equipment and kindred products. Adjoining space of 15,000 sq. ft. is available for future extensions.

Cliffside Commercial Body & Iron Works, Inc., Cliffside, N. J., has been organized to manufacture commercial automobile bodies and equipment, iron specialties, etc. New company will take over and expand local Cliffside Commercial Body Works. Ezra L. Nolan, 89 Monticello Avenue, Jersey City, N. J., is representative.

Distillers Co., Ltd., Glasgow, Scotland, care of Howard Chapman, 420 Lexington Avenue, New York, architect, has purchased more than five acres at Linden, N. J., for new distilling plant. Initial unit will be two stories, U-shaped, 243 x 352 ft., with smaller buildings, for which general contract has been let to Turner Construction Co., Graybar Building New York. Cost over $400,000 with equipment.

Navy Department, Naval Aircraft Factory, Navy Yard, Philadelphia, is securing fund of $2,700,000 from recently approved PWA naval construction appropriation, for extensions and improvements for production of airplanes, engines, parts, etc., including new buildings and machinery, and remodeling of different present equipment. New division will be established for airplane engine manufacture.

Lehigh Coal & Navigation Co., 1421 Chestnut Street, Philadelphia, has plans for rebuilding portion of colliery at coal mining plant near Tamaqua, Pa., recently destroyed by fire. Loss over $100,000, including hoisting, conveying and other mechanical equipment.

◀ BUFFALO DISTRICT ▶

Daystrom Corpn., Olean, N. Y., Lloyd C. Dahmen, president, manufacturer of utility metal cabinets, coasters and other metal products, has taken over former plant of Olean Metal Co., Franklin Street, for new factory. Company is removing former plant at Jamestown, N. Y., to new location.

Steelcraft Piston Ring Co. of Ohio and Western New York, Inc., Buffalo, has been organized under direction of Sydney S. Siegel, Stock Exchange Building, to manufacture steel piston rings and kindred products.

Board of Education, 801 City Hall, Buffalo, asks bids until July 10 for stokers, boiler tubes, transformers and other equipment for public schools. James Storer is secretary.

Richfield Oil Co., Jamestown, N. Y., is considering rebuilding part of bulk oil storage and distribution plant recently destroyed by fire. Loss about $25,000 with equipment.

◀ NEW ENGLAND ▶

Economy Oil Co., South Portland, Me., has plans for new bulk oil storage and distributing plant, with main unit, 38 x 90 ft. Cost about $40,000 with steel tanks and equipment. Addison G. Pulsifer, 163 Main Street, Lewiston, Me., is architect.

Norge Corpn., Central Avenue, Detroit, manufacturer of electric refrigerators, has contracted with Silent Glow Oil Burner Corpn., 1477 Park Street, Hartford, Conn., to manufacture a new pressure type burner for Norge equipment, and production will be carried out at local plant.

Nicholson File Co., Wallace Street, Providence, R. I., manufacturer of files, rasps, etc., will soon begin erection of two-story and basement addition, 45 x 150 ft., to branch plant at Port Hope, Ont. Cost close to $40,000 with equipment. Sproatt & Rolph, 1162 Bay Street, Toronto, are architects.

Dymaxion Corpn., Bridgeport, Conn., has been organized by Philip C. Pearson and Buck-

TRAGEDY

RAIDED A NEW YORK PLANT

and took away nine eyes

For three years, an AO Safety Engineer called on a New York plant and pointed out the need for a more complete eye protection. Each time he was courteously received . . . each time he was told that the company's safety record showed no serious eye accidents.

But last October, the blow fell. Within thirty days, nine eyes were lost on jobs where goggles were not worn. When all bills were paid, the cost was more than enough to have bought eye protection for all employees for more than twenty years.

Where eye hazards exist and goggles are not used . . . you pay for goggles whether you buy them or not. Recognizing that no one type of goggle is suitable for all classes of work, American Optical Company has developed a complete line of eye protection equipment that covers practically every eye hazard. An AO industrial representative from a branch office near you will be glad to recommend a practical eye safety program exactly fitted to the needs of your plant. Call him in today.

AO GOGGLES PROTECT WORKERS' EYES AND COMPANY PROFITS

The Duralite "50" Goggle shown above is recommended for men employed on such operations as grinding, sanding, chipping, stamping, wire cutting, breaking brickwork or masonry and other similar jobs. The Super Armorplate lenses provide greater resistance to impact than any other standard lens on the market.

American Optical Company

Manufacturers, for more than 100 years, of products to aid and preserve vision. Factories at Southbridge, Mass. Branch offices in all principal industrial centers. In Canada, Consolidated Optical Co., Ltd., Toronto.

1091

minster Fuller, both Darien, Conn., to manufacture motor vehicle equipment and parts.

United States Brass & Copper Co., Boston, has been organized by John J. Dervan, 75 Crest Avenue, Winthrop, Mass., to manufacture brass and copper tubing and kindred products. As reported in these columns last week, new company has taken over former Stafford plant, Hyde Park, of Draper Corpn., Hopedale, Mass., for new works.

Board of Water Commissioners, Paxton, Mass., will soon take bids for new steel standpipe for municipal water system. X. Henry Goodnough, Inc., 14 Beacon Street, Boston, is consulting engineer.

SOUTH ATLANTIC

City Commission, Deland, Fla., is considering new municipal electric light and power plant. Financing is being arranged. Cost over $100,000 with equipment. G. A. Dreka is chairman of committee in charge.

DeSota Brewing Co., Tampa, Fla., has acquired three-story and basement building at West Tampa, 55 x 175 ft., and will remodel for new plant. Cost over $50,000 with machinery. Daniel Arias is head.

Gastonia Coca-Cola Bottling Co., Gastonia, N. C., has plans for new bottling plant. Cost over $45,000 with machinery. W. B. Garrison is general manager.

Nanthala Power & Light Co., Bryson City, N. C., plans transmission line from power plant at Highlands, N. C., to Cashiers Valley district. Cost about $25,000 with equipment.

Potato Products Co., Quitman, Ga., recently organized, care of Conrad O. Hersam, Walton Building, Atlanta, Ga., consulting engineer, has plans for new starch manufacturing plant at Quitman, where large tract has been secured. Plant will operate under special process and will include power house, pumping station and machine shop. Cost over $200,000 with processing and other machinery. D. B. Osborne, Club Drive, N. E., Atlanta, is interested in new company.

WESTERN PENNA.

Susquehanna Distilling Co., Interstate Fair Grounds, Athens, Pa., C. E. Miller, president, plans extensions and improvements in buildings recently acquired for new plant. Cost about $50,000 with machinery.

Perry Oil & Gas Corpn., Saxonburg, Pa., F. L. Lefever, treasurer, is arranging for sale of stock to total $249,000, considerable part of fund to be used for expansion and development of oil and gas properties, including equipment, pipe lines, etc. Company was organized recently and proposes to operate a refinery in this district. W. I. Gettman, Zelienople, Pa., is general manager.

Valvoline Oil Co., East Butler, Pa., has begun expansion and improvements at local refinery, to include installation of tanks, pumping machinery, etc. Cost close to $400,000 with equipment. Headquarters are in Chrysler Building, New York.

H. J. Heinz Co., 1062 Progress Street, Pittsburgh, canned food products, has let general contract to S. E. Dinsmore Co., Security Building, Windsor, Ont., for three-story additions to branch plant at Leamington, Ont., 40 x 125 ft., and 25 x 65 ft., respectively. Cost about $125,000 with equipment. Sheppard, Masson, Trace & Colthurst, Equity Chambers, Windsor, are architects.

SOUTH CENTRAL

Bluegrass Brewery Co., Winchester, Ky., R. Brooks Taylor, president, has plans for new brewery, to cost about $115,000 with equipment.

United States Engineer Office, Louisville, asks bids until July 24 for one 1600-hp. Diesel engine unit for dredge pump.

Director of Purchases, Tennessee Valley Authority, New Sprankle Building, Knoxville, Tenn., asks bids until July 9 for three 3333-kva., single phase, self-cooled, power transformers, and auxiliary equipment for electric power distribution; until July 12, furnishing, fabricating and delivering 16 draft tube pier nose castings and steel columns for Wheeler Dam project, Tennessee River, near Muscle Shoals, Ala.

City Council, Alexandria, La., asks bids until July 17 for three 750-hp. boilers, with superheaters and accessories; two forced draft fans, three boiler feed pumps, two fuel oil heaters and pumps, pressure reducing valves and other equipment, including reconditioning of steam turbine unit, for municipal electric light and power plant. I. W. Sylvester is city engineer.

Southern Syrup Co., 314 Girod Street, New Orleans, plans installation of boilers, pumps and other mechanical equipment for new local plant. Property has been acquired and will be remodeled. Cost over $40,000 with machinery. Hugh K. Smith is general manager.

OHIO AND INDIANA

Smith Agricultural Chemical Co., Columbus, Ohio, manufacturer of commercial fertilizers, has acquired tract near city limits, Saginaw, Mich., and plans early erection of one-story branch plant, 175 x 300 ft. Cost about $90,000 with equipment. John E. Powell is vice-president and superintendent.

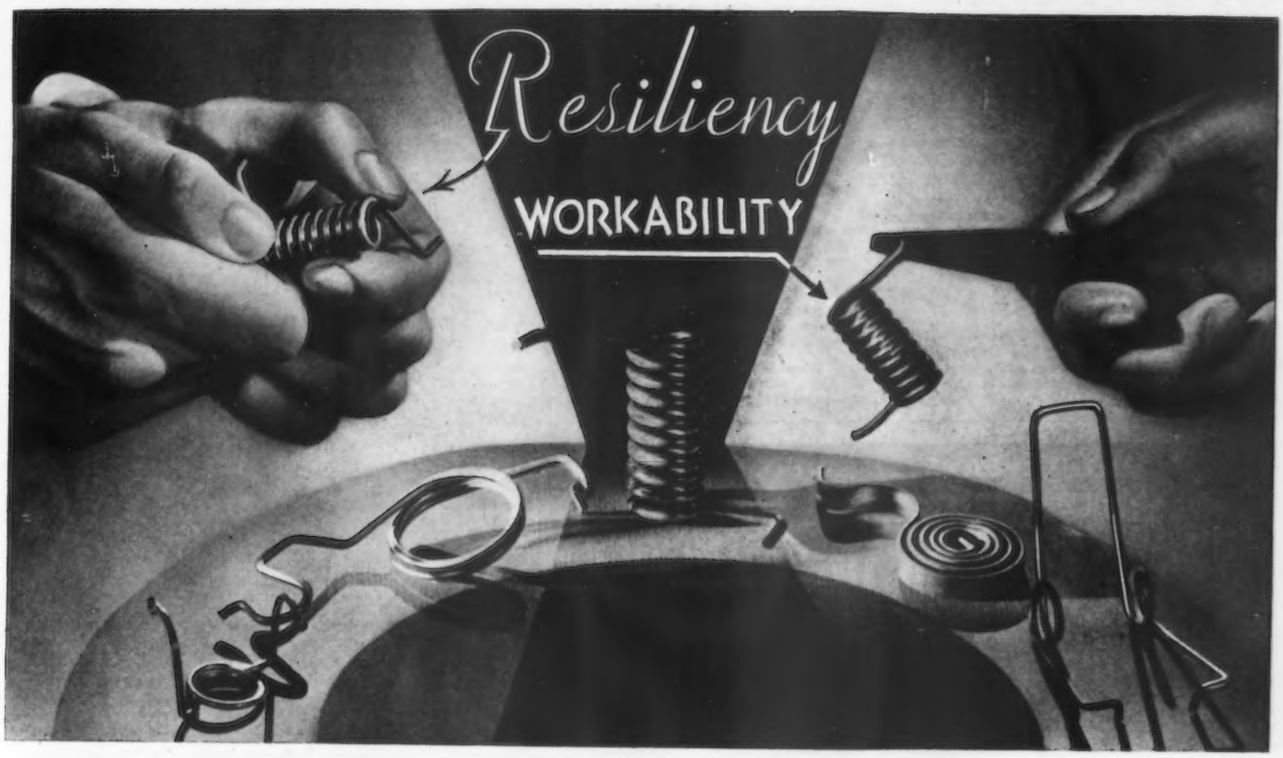
Morgan Steel Products Co., Inc., Morgan Avenue, S. E., Cleveland, James Morgan, president, lately organized, has plans for one-story addition to building recently leased, location noted, to be 83 x 100 ft., for production of steel tanks, stacks and other steel plate products. Cost over $35,000 with equipment.

National Brass & Copper Co., plant, Lisbon, Ohio, recently acquired by new interests, headed by C. W. Hays and Floyd Rose, will be remodeled for production of a line of steel specialties, as well as brass and copper products. An addition is planned. Cost over $100,000 with equipment.

Cuyahoga Aluminum Co., Cleveland, has been organized by M. G. Clark and associates, under direction of H. L. Wolpaw, 917 Society for Savings Building, representative, to manufacture aluminum and other metal products.

Norwalk Foundry Co., Norwalk, Ohio, plans early rebuilding of part of machine shop recently destroyed by fire. Loss about $25,000 with equipment.

Common Council, New Palestine, Ind., is considering new municipal electric light and power plant. Cost over $75,000 with equip-



Springs With DUAL PERSONALITY

The perfect phosphor bronze spring must be hard enough to hold its resiliency, but workable enough to permit sharp bends without breaking. This "dual personality" is outstanding in Seymour Phosphor Bronze spring metal. Above are illustrated a few springs taken from the production of one of our customers. Note the number of bends, some running as many as eight—all formed without annealing, and without cracking or breaking.

The reason for this nice metallurgical balance lies in the careful selection of the virgin metals that go into Seymour Phosphor Bronze, and in the uniform practice of making thorough laboratory tests.

Samples of all furnace heats are taken for chemical analysis. No metal leaves the casting shop until released by the laboratory with full approval of the heat. Tests are also made for hardness, ductility, tensile strength and grain structure. Alert supervision is present at every stage of production, and each heat goes through the plant with its own identification number.

For a number of years, Seymour Phosphor Bronze sheets, wire and rods have been servicing the electrical, mining, textile, paper, automotive, marine, and numerous other industries in which fine, non-corrosive spring metal is considered vital.

If you have had difficulty in obtaining good bronze, describe your problem to us and we will be glad to make it a subject of special investigation without obligation to you.

FOR SERVICE

THE SEYMOUR MANUFACTURING CO., 24 FRANKLIN ST., SEYMOUR, CONN.

SEYMOUR

SHEETS, WIRE, RODS

PHOSPHOR BRONZE

ALSO: NICKEL SILVER SHEETS, WIRE, RODS : AND NICKEL ANODES

ment. Charles Herrlich is chairman of committee in charge.

Jenkins Motor Co., Inc., 507 Occidental Building, Indianapolis, recently organized by John W. Jenkins and associates, capital $100,000, has leased factory at Ethel Avenue and Twenty-fifth Street and will remodel for manufacture of special automotive engine heads and kindred automotive equipment. Initial operations will be given over to assembling, with parts to be produced by outside plants.

Capital Valve Corpn., 8 East Market Street, Indianapolis, has been organized by Harry S. Burke and Hurshal E. Parker, to manufacture special air pressure valves, automotive parts and equipment.

SOUTHWEST

Anheuser-Busch, Inc., 721 Pestlozzi Street, St. Louis, plans expansion and improvements in local breweries, including equipment. Cost over $1,000,000 with machinery. R. A. Huber is vice-president.

City Council, Independence, Mo., will soon take bids for new 3000 kw. turbo-generator unit and other equipment for municipal electric light and power plant. Cost about $120,000. Black & Veatch, Mutual Building, Kansas City, Mo., are consulting engineers.

United States Engineer Office, Kansas City, Mo., asks bids until July 10 for chopping axes, water buckets, linesman's grips, gasoline blow torches, etc. (Circular 1111); chopping axes, files, axe handles, coal scoops, nut wrenches, carpenter's hammers and other tools (Circular 1108); until July 11, bolts, screws, nails, etc. (Circular 1181), unions, plugs, valves, nipples, bushings and other fittings (Circular 1107).

North American Car Corpn., 327 South La Salle Street, Chicago, has leased repair shops of Missouri Pacific Railway Co., at Texarkana, Ark., and will remodel for branch plant for construction and repair of tank and refrigerator cars, and other freight cars. New units will be built later. Cost over $75,000 with equipment.

Blue Bird Anthracite Mining Co., Hartman, Ark., plans rebuilding of tipple and portion of coal-mining plant recently damaged by fire. Loss about $50,000 with equipment. David McGraw is head.

City Council, Austin, Tex., Guiton Morgan, city manager, has authorized bond issue of $857,000 for new municipal electric light and power plant, extensions and improvements in municipal waterworks and sewage system, including equipment.

L. R. Flori Co. has moved into one-story factory building at 601-617 Red Bud Avenue, St. Louis, containing 30,000 sq. ft. of floor space, with adjoining two acres for storage. Plant is being equipped to fabricate and recondition pipe, including a hydrostatic used pipe testing machine.

MIDDLE WEST

Mercury Mfg. Co., 4118 South Halsted Street, Chicago, manufacturer of steel hand trucks, factory and shop tractors, trailers, parts, etc., has let general contract to Poirot Construction Co., 2001 West Pershing Road, for rebuilding one-story assembling plant, 127 x 210 ft., recently damaged by fire. Cost about $45,000 with equipment. A. Epstein, 2001 West Pershing Road, is architect and engineer.

A. A. Schneiderhahn Co., 1022 Walnut Street, Des Moines, Iowa, manufacturer of electrical appliances and equipment, plans early rebuilding of part of plant recently destroyed by fire. Loss about $80,000 with equipment.

Libby, McNeil & Libby, Union Stock Yards, Chicago, manufacturer of food products, has plans for one-story canning plant at Manzanola, Colo. Cost about $50,000 with equipment.

Hercules Tool & Mfg. Co., 2242 North Racine Avenue, Chicago, has been organized by Hans and Gerhard P. Stockel, to manufacture tools and kindred equipment.

Watab Pulp & Paper Co., Sartell, Minn., has plans for mill extensions and improvements, including additional equipment. Power house will be enlarged and new machinery installed. Cost about $100,000 with equipment.

International Harvester Co., East St. Germain Street, St. Cloud, Minn., plans one-story addition to factory branch, storage and distributing plant. Cost over $35,000 with equipment. Headquarters are at 606 South Michigan Avenue, Chicago.

Mile High Distillery Co., South Jason Street and Arkansas Avenue, Denver, recently organized, has let general contract to Denver Builders, Inc., 1425 Welton Street, for new plant at location noted. Cost over $70,000 with machinery.

General Grain Corpn., Paris, Ill., plans rebuilding local grain elevator recently destroyed by fire. Loss about $100,000 with screening, elevating, conveying and other equipment. Company is affiliated with General Mills, Inc., Chamber of Commerce Building, Minneapolis, Minn.

Anderson, Shumaker Co., 824 South Central Avenue, Chicago, manufacturer of forgings, etc., will soon take bids for new one-story plant, including forge shop, boiler plant and office unit, at Broadview, Ill. Carl Westerlind, 179 West Madison Street, Chicago, is architect.

MICHIGAN DISTRICT

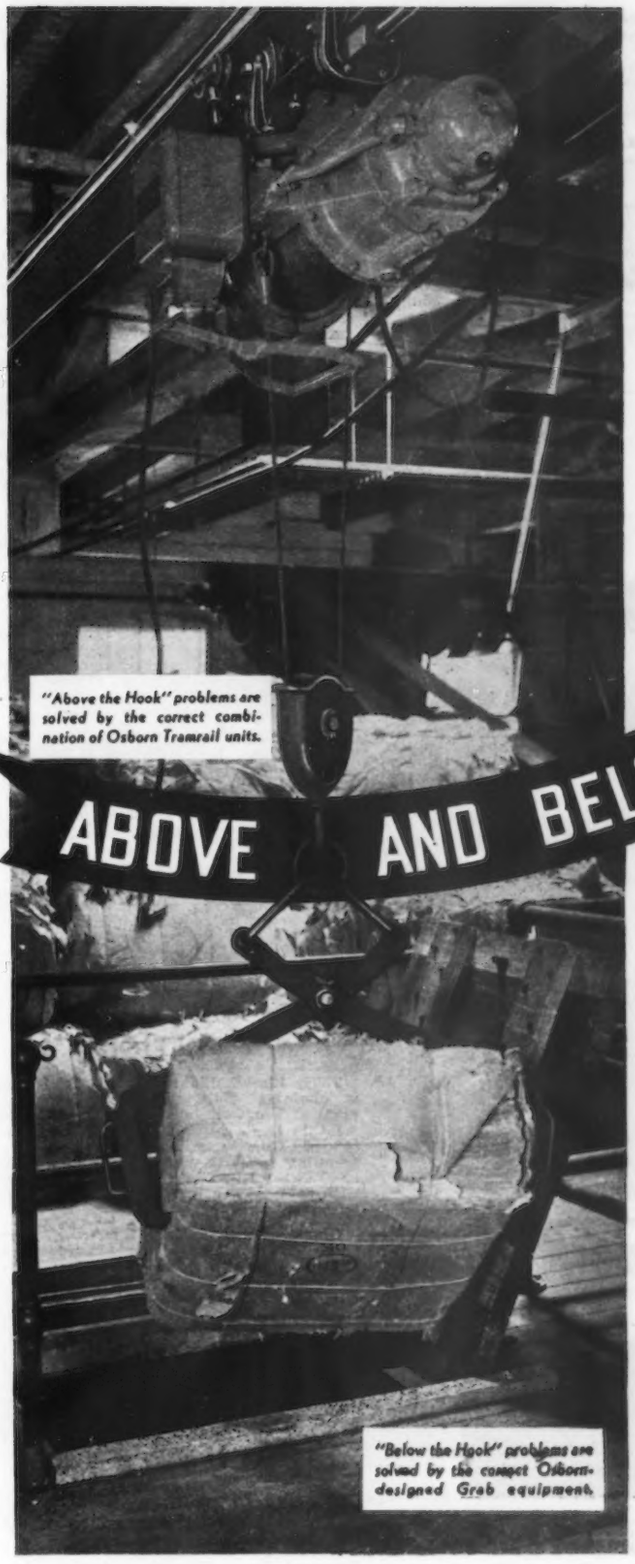
Dow Chemical Co., Midland, Mich., has leased two one-story buildings near city limits, Bay City, Mich., 100 x 500 ft., and 100 x 300 ft. respectively, and will remodel for branch plant for manufacture of Dowmetal metal trailers and equipment. Cost about $50,000 with equipment.

Briggs Mfg. Co., 11631 Mack Avenue, Detroit, manufacturer of steel automobile bodies, steel sinks, etc., has plans for one-story addition. Cost over $60,000 with equipment. Giffels & Vallet, Inc., Marquette Building, is architect.

Gillboat Corpn., Holland, Mich., manufacturer of motorboats, parts, etc., has taken over former plant of Ottawa Furniture Co. and will remodel for new plant. Cost about $45,000 with machinery.

National Furnace Co., Detroit, has been organized by Howard B. Lawton, 10040 Freeland Avenue, and associates, to manufacture furnaces and parts, and kindred heating equipment.

Brass Forgings, Inc., Detroit, recently organized by W. N. Coyer, will begin operations within 30 days at 693 East Congress Street.



ABOVE AND BELOW THE HOOK

ONE of countless applications of Osborn Tramrail Systems to meet particular requirements is illustrated. In this plant, it was necessary to move materials from floor to floor, quickly and economically . . . . The desired results were secured by selecting a correct combination of Osborn Tramrail units.

In YOUR plant, there may be opportunities to utilize the many time-saving, cost-reducing advantages of Osborn Tramrail units. A "check-up" by Osborn Tramrail engineers costs nothing. A survey may point the way to improved methods and lower costs.

There are important reasons for our suggesting that . . . Before you invest in materials handling equipment . . . INVESTIGATE Osborn Tramrail Systems.

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVENUE, CLEVELAND, OHIO, U.S.A.

OSBORN

TRAMRAIL SYSTEMS

America's Better Collet Co., manufacturer of collets and screw machine products, 424 Superior Street, Detroit, was recently taken over by John L. Alexander.

WASHINGTON DISTRICT

Big Four Distilleries, Inc., Baltimore, recently organized as an interest of United Distilleries of Canada, Ltd., Vancouver, B. C., care of H. H. Klein, Potomac Distilling Corpn., 2700 Wilmarco Avenue, Baltimore, representative, has purchased about 14 acres in Dundalk district as site for new plant. Initial distillery will consist of several one and multi-story units, with power house, machine shop and other mechanical departments. Cost over $350,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until August 15 for reerection of 200-ton hammerhead crane at Pearl Harbor Navy Yard, T. H. (Specification 7641).

Division of Purchases and Sales, Department of Commerce, Washington, asks bids until July 13 for five 91-ft. and five 75-ft. steel towers, with plates, bolts and miscellaneous tower parts (Proposal 26240).

Puritan Compressed Gas Corpn., Race and McComas Streets, Baltimore, has let general contract to Fred Keller & Son, 3405 Echodale Street, for one-story addition, 40 x 115 ft. Cost about $35,000 with equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until July 10 for one clamshell bucket, wire rope, 12 metal-slitting circular saws, 12 circular saws, brass or bronze pipe fittings, brass globe valves, gate valves, range boilers, 16,000 lb. steel welding rods, 10,000 lb. steel track spikes, 1000 lb. mule shoes, 300 lb. horse shoes, gages and other equipment (Schedule 2974); until July 12, turnbuckles, steel ring bolts, malleable iron railing fittings, steel cap screws, boat spikes, brass screw eyes, etc (Schedule 2976).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 10 for two automatic screw and bar machines (Schedule 2812) for local navy yard.

PACIFIC COAST

Santa Cruz Portland Cement Co., Crocker Building, San Francisco, has plans for new cement treatment mill at Long Beach, Cal., to include power house, steel silos, bins and other structures. Cost over $200,000 with equipment. R. A. Kinzie is chief engineer.

Consolidated Aircraft Corpn., 2050 Elmwood Avenue, Buffalo, manufacturer of airplanes and parts, has plans for new works on 20-acre tract at Lindbergh Field, San Diego, Cal., where production will be concentrated in future. Initial units will consist of one-story shop and assembling works, 300 x 500 ft.; storage and distribution plant, 100 x 100 ft.; hangar unit, 100 x 120 ft., and two-story office building. Present Buffalo works will be removed to new location later. Cost over $450,000 with equipment.

Sunland Sulphur Co., Fresno, Cal., manufacturer of commercial fertilizers, has plans for three new one-story additions, 60 x 100 ft., 53 x 60 ft., and 41 x 60 ft. respectively. Cost about $40,000 with equipment.

Grays Harbor Pulp & Paper Co., Hoquiam, Wash., plans addition to pulp division, with installation of equipment. Cost about $100,000 with machinery.

Bureau of Reclamation, Los Angeles, asks bids until July 26 for construction of Parker Dam and appurtenant works, Parker Dam project, California-Arizona, including 4,100,000 lb. spillway gates and hoists, 315,500 lb. metal pipe and fittings, 1,874,000 lb. steel reinforcement bars, etc. (Specification 574.)

Ray-Maling Co., Inc., Yakima, Wash., canned food products, B. E. Maling, Hillsboro, Ore., president, has let general contract to Charles W. Ertz Construction Co., Pittock Block, Portland, for one-story canning plant, 117 x 150 ft. Cost about $40,000 with equipment. Charles W. Ertz, last address noted, is architect.

Elk Grove Fruit Growers' Association, Elk Grove, Sacramento County, Cal., James Rusby, manager, plans new winery, with power house. Cost over $85,000 with equipment.

G. Maselli & Sons, Inc., 2310 Railroad Avenue, Fresno, Cal., plans one-story addition to winery, 92 x 176 ft. Cost about $32,000 with equipment.

FOREIGN

Tokyo Electric Light Co., Ltd., Tokyo, Japan, is planning addition to electric generating plant at Tsurumi, Japan, to include new equipment to triple present output. Cost over $1,500,000 with machinery. Company is also planning series of hydroelectric power plants on Tadami River. Cost more than $5,000,000 with transmission lines, substations and auxiliary structures.

Glanzstoff-Courtaulds, G.m.b.H., Cologne, Germany, manufacturer of rayon products, plans new buildings and machinery to increase present capacity about 20 per cent. Cost over $400,000 with equipment.

Ministry of Industries, Government of China, Nanking, China, plans new iron and steel mill to be operated as Federal enterprise, with power house and other mechanical structures. Cost over $5,000,000. It is understood that plans will be drawn and construction supervised by H. A. Brassert & Co., 310 South Michigan Avenue, Chicago, consulting engineers.

A hearing on the question of establishing permanent trustees of the Pressed Steel Car Co. of New Jersey has been scheduled for July 12 by Judge R. M. Gibson in the United States District Court. The trustees are George D. Wick, Walter A. Bonitz and Frank N. Hoffstot, who were named recently by the court on a petition to reorganize under the Federal Bankruptcy Act. The three trustees had been appointed previously receivers in bankruptcy.

The Properties of LEAD

No 7
Of A Series

PLIABILITY and MALLEABILITY

Lead drain connections for use in the Joseph Vance Building, Seattle. Note pipe bending and lead wiping operation.

PLIABILITY • The pliability of lead is an important contributing factor in the extensive use of the metal for pipe, tubing and cable sheathing. This property allows lead pipe to be procured in long lengths and to be bent around obstacles, thus eliminating costly joints and elbows, which are also a source of weakness. This property also permits expansion and contraction due to temperature, as well as any distortion that might occur because of uneven settling or vibration in the ground.

MALLEABILITY • The major application of lead, because of its unusual malleability and plasticity, combined with its comparatively low cost, is in the manufacture of lead foil. A comparison of these properties of lead with other common nonferrous metals is given in the following table:

	Resistance to Equivalent Deformation lbs. per sq. in.	Order of Malleability (Liddell)
Lead	4,500	3
Tin	7,000	2
Aluminum	25,500	1
Zinc	29,000	4

Tea protected with lead foil. One package is torn open showing the foil lining, which is .0015 in. thick.

The foil industry is the fourth largest consumer of pig lead. Lead foil has remarkably high resistance to corrosion and the passage of light rays and moisture, and will not impart the slightest trace of taste or smell to the commodity which it protects.

Pliability, malleability and plasticity are properties of lead which are important factors in the following applications as well: Cable sheathing, roofing, leaders, gutters, ornamental work and collapsible tubes.

ST. JOSEPH LEAD COMPANY

250 PARK AVE. NEW YORK, N.Y.

The COUNTRY'S LARGEST PRODUCER of DOMESTIC PIG LEAD

LEAD INDUSTRIES ASSOCIATION — RELY ON LEAD

Effect of Heat Treatments on the Properties of Die Steel

(Concluded from page 27)

were also measured with a Vickers tester. Table 10 shows these results. It can be seen from these figures that in both air- and furnace-cooled specimens the abrasion loss rapidly decreases with increasing hardness up to 500 blows, while above 1000 blows the change is very small. In general, the effect of cold-working is greater for furnace-cooled than for air-cooled specimens.

Impact tests at high temperatures were next investigated by means of a Charpy tester. As the impact values of these materials are very small, a small energy of impact equal to 4.4745 kg.m. was given with a falling velocity of the impact pendulum equal to 1.999 m. per sec. in order to indicate markedly the absorbed energy on the measuring disk. Each specimen was air-cooled or oil-quenched from 1000 deg. They were then heated at 100 to 600 deg. for 1 hr. and quickly set at the tester for the taking of measurements. The results of these tests are shown in Table 11. The values shown are a mean of two measurements.

As can be seen in these results, the impact values of the air-cooled specimens increase with a rise of temperature, and the values for high-chromium high-carbon steels are generally large. The value of specimen No. 6 is very small until 300 deg. but it rapidly increases at a higher temperature. The value for the specimens oil-quenched also increases with temperature, but the increasing rate is generally less than that for the air-cooled specimens. Specimen No. 6 shows the highest value at temperatures below 400 deg. but above 400 deg. it decreases.

Discussion of Results

(1) With six commercial die steels the change of transformation points due to the rate of cooling and maximum heating temperature was studied by means of magnetic analyses and differential dilatometric measurements. The hardness and resistance to abrasion of these specimens were measured after several heat treatments, and impact tests and impact hardness tests were carried out at high temperatures.

(2) The transformation points of high-carbon steel and low-chromium high-carbon steel do not change greatly with the cooling rate, but high-chromium high-carbon steels and tungsten - chromium steel change markedly.

(3) It has been concluded from the results of the hardness test that for furnace-cooling there is small difference of hardness among the specimens, and the effect of maximum heating temperature is also slight. The hardness of the specimens air-cooled is, generally, higher than that for the furnace-cooled. The hardness of the specimens, especially high-chromium high-carbon steels, increases markedly with a rise of the maximum heating temperature, and by air-cooling from 1100 deg. a sufficient quenching effect results. By oil-quenching the high-chromium high-carbon steels from 1000 deg. a maximum hardness is obtained. The high-carbon steel without a special element shows generally the lowest hardness among these specimens. The hardness of low-chromium high-carbon steel and tungsten-chromium steel markedly decreases as the heating temperature rises and shows a secondary hardening on tempering. High-chromium high-carbon steels show considerable secondary hardening on the tempering of oil-quenched specimens from 1150 deg.

The specimens furnace-cooled from 900 deg. were annealed at several temperatures to determine the softening temperature and it was found that specimens kept at about 750 deg. for 1 hr. and furnace-cooled show a minimum hardness.

(4) From the results of the abrasion test it was concluded that the resistance to abrasion is the greatest in oil-quenched specimens. In specimens furnace-cooled and air-cooled the abrasion loss is the least with tungsten-chromium steel. The resistance to abrasion of an air-cooled specimen is generally greater than that of a furnace-cooled, and carbon steel without special elements generally shows small resistance to abrasion under any conditions.

(5) The results of the impact hardness test at high temperature are similar to that of the hardness test at room temperature. The hardness of high-chromium high-carbon steels is generally high. With a high quenching temperature low-chromium high-carbon steel, high-chromium high-carbon steels, and tungsten-chromium steel show secondary hardening on tempering.

(6) The results of the impact test at high temperature show that the value is generally very small, especially for specimens oil-quenched, and the impact resistance increases slightly with a rise in temperature. High-chromium high-carbon steels generally show a small value, whereas tungsten-chromium steels when oil-quenched show a large value and have a maximum value at 400 deg. In the air-cooled specimens high-carbon steel generally shows the least value, but it increases rapidly with a rise in temperature.

THIS MARK - ◇C◇ - SYMBOL OF THE HIGHEST QUALITY — IS STAMPED UPON EVERY "CLEVELAND" TWIST DRILL AND REAMER. IT IS YOUR ASSURANCE OF VALUE, AND YOUR PROTECTION.

* * * * * * *

THE CLEVELAND TWIST DRILL COMPANY, *Cleveland, Ohio, U. S. A.*

BRANCHES IN NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO, LONDON

DO BUSINESS PAPERS N

By An Agency Space Buyer

Trade paper publishing might, if we dare to be facetious about such a serious profession, be likened to the three little pigs. There is the industrious little pig who goes on with his own careful building and attends thoughtfully to his own affairs—affairs which in the trade paper publishing business the past few years have been quite sufficiently desperate to require more than ordinary thought and planning.

And there are the two little pigs who build carelessly, wastefully, giving no heed to the winds and the storms or the dire visitor who may threaten at some future date.

At this late date, it certainly isn't necessary to retell the story of the big, bad wolf who drove the two improvident little pigs into the substantial shelter constructed by the pig who took thought for the morrow and built accordingly. Personally, I'd like to see the Big, Bad Wolf of Advertising drive many more little pigs into the homes of the first little pig—to stay forever!

For there are far too many trade papers. Too many little pigs who feed on what belongs to the thoughtful little pigs who stay in existence because the Big, Bad Wolf of Advertising has let them live instead of, with a kindness that may seem cruel but really isn't, driving them into the arms of their better financed, better edited, better read, and more resultful competitors.

It is impossible to lay down any rule as to the number of trade papers which have a legitimate excuse for existing. Each field of industry has its individual story and each paper in that industry deserves separate analysis.

How many trade papers are there? If we accept the Standard Rate & Data Service as listing the majority of the worth-while trade papers, we find that the November, 1933, issue has a listing of 1,374 different trade and professional papers reaching a great variety of trade divisions or professional groups.

In some of the fields we find a number of papers covering very definite and logical groups. The fact that there are 127 trade papers in the food group, for instance, may not be so startling as it sounds (though it is certainly bad enough!), since this food group comprises all the different kinds of food manufacturing from flour milling to the packing industry. In the medical group, 120 professional papers are a "lot of media" for any drug, food, or professional equipment manufacturer to consider, but here again there are certain spheres of the medical profession which do, to some extent, explain this large number.

I have divided the 1,374 trade papers into 54 general groups, all of which, with the exception of a general miscellaneous group of 42 papers which covers small industries where a very limited number of papers are distributed, are publications in fields sufficiently allied to give a logical basis for this grouping. These groups and the number of papers in each group, are shown in the chart below.

It should be of interest to every advertiser who, after all, is more, rather than less, responsible for the life of these papers, to know what kind of a publishing job they are doing, and who among them are really trying to render a service that shows recognition of the relation of his medium and its coverage to trade paper space buying.

Trade paper advertising is an important part of the advertising campaign. In some cases, it is the principal part. It reaches a highly selected audience which, presumably, should be in the position to buy or recommend the purchase of the advertiser's products.

The fact that 1,374 trade papers are supported by advertisers, and except for a few association papers, owe their very existence to these advertisers, would seem to indicate that no great amount of analysis or conscientious buying has been made in the media selection for the advertising schedules of some advertisers. Buying a "pig in a poke" is putting it mildly in some cases.

Let us assume that recognition of the audit bureaus indicates an effort on the part of the publisher to furnish the advertiser with a clear statement of circulation which may be compared with competitive circulation statements. How general is this recognition? In some groups we find close to 50 per cent of the papers audited either by the A.B.C. or C.C.A. These groups are:

Advertising	10	papers out of	25	are audited
Architecture	5	"	10	"
Cleaning and dyeing	5	"	9	"
Electrical trade	12	"	19	"
Machinery	5	"	10	"
Metal trade	11	"	26	"
Petroleum	10	"	19	"
Railroads	8	"	14	"

		Papers
1.	Advertising, including outdoor and window display	25
2.	Architecture	10
3.	Automobile, including buses, trucks, and warehousing	45
4.	Aviation	10
5.	Banking and finance	50
6.	Barbers, beauty shops	13
7.	Books, book-trade, journalism, printing, lithography	34
8.	Bottling, brewing, and soft drinks	36
9.	Building, building materials, cement, concrete, real estate	34
10.	General business and industry, including office methods, selling, and stationery	81
11.	Cemetery, monuments, funeral directors	12
12.	Chemistry and chemical engineering	6
13.	Cleaning and dyeing, laundering	9
14.	Clothing, furs, gloves, knit-goods, hats	34
15.	Dentistry	21
16.	Drugs, soap, sanitary products, cosmetics, toilet goods	40
17.	Education	43
18.	Electricity and telephony	19
19.	Export, traffic, transportation	26
20.	Engineering and contracting, power, roads and streets, stone products, water works	47
21.	Florists and floriculture	7
22.	Food: baked goods, canning, confectionery, fish, groceries, ice cream, meats, milling and cereals, nuts	127
23.	Furniture, carpets and rugs, housefurnishing, lamps, wallpaper	23
24.	Gas	6
25.	Hardware, farm implements, sporting goods	21
26.	Hospitals and nursing	13
27.	Hotels, clubs, restaurants	30
28.	Insurance	35
29.	Jewelry and optical goods	11
30.	Leather, boots and shoes, trunks and leather goods	21
31.	Lumber, woodworking	20
32.	Machinery	10
33.	Marine, boating	23
34.	Medicine, veterinary	120
35.	Metal trade	26
36.	Mining, coal, and metal	16
37.	Miscellaneous: odd groups with very limited list	42
38.	Motion picture, amusements	15
39.	Municipal	12
40.	Music	23
41.	Packaging	6
42.	Paint	9
43.	Paper	9
44.	Petroleum	19
45.	Photography, photo-engraving	6
46.	Plumbing and heating	16
47.	Pottery and glass	14
48.	Radio	17
49.	Railroads, electric and steam	14
50.	Refrigeration	7
51.	Retailing—a combined group including drygoods, general merchandise, and notions	27
52.	Rubber and tires	4
53.	Textiles	17
54.	Tobacco	12

NEED A BIG, BAD WOLF?

In other words, eight groups out of the 54 contain trade papers which, as leaders in their field, recognize the audit bureaus. This recognition falls short of the ideal, but it does indicate a preference for audited reports.

In all the other groups, the percentage of audited papers is far below 25 per cent of the total number of papers, and while in a few cases it is evident that the audited papers are the leaders in their field, it is also apparent that non-audited papers are receiving sufficient support from the advertisers to maintain them as competitors of the audited magazines.

A study of all the audited papers among those 1,374 listed shows the following:

218 or 15.9% are members of the A.B.C. (11 of these are association papers, not included below).
48 or 3.5% are members of the C.C.A.
284 or 20.6% are Association organs (11 of these are also A.B.C.).
113 or 8.2% are distributed free, but unaudited.
711 or 51.8% are, as far as we can discover, over 60% paid but unaudited.

There are, then, 1,213 paid subscription papers, including association organs, out of which only 17.9 per cent are audited by the A.B.C. This is a discouragingly small percentage and would seem to indicate that the trade paper advertiser is not as strict as he might be in limiting his support as much as possible to those papers which can give him an audited report on the circulation and coverage he is purchasing.

In the free-circulation group the 48 C.C.A. papers (we have not included C.C.A. applicants) represent 29.8 per cent of the total free distribution papers. This would seem to indicate, in view of the youth of the C.C.A., that the advertiser has been more inclined to demand an audited report, or the publisher more ready to recognize its worth. On the other hand, audits of free-controlled circulation papers are, for the most part, very simple matters and circulation records are less involved for the publisher. It is, therefore, much easier to become an accepted member of the C.C.A. than of the A.B.C. Moreover, the free-controlled circulation method, while not entirely new, has never been a strong competitor of the subscription paper in the United States until within the last 20 years. Advertisers have, therefore, been quicker to demand proof of circulation and coverage, which has given the C.C.A. a greater opportunity to interest prospective applicants. C.C.A. membership, as a matter of fact, presents an even better picture when we consider that of the 113 unaudited papers distributed free, 20 of them were established in 1933 to cover the beer and liquor industries.

We find, by this analysis, that advertisers are supporting 1,108 trade and professional papers which are unaudited and which may, or may not, furnish sworn statements of circulation on demand from advertiser or agency.

There are three fields where there are no audited papers at all and where it is known in advertising circles that some of the publishers refuse to issue any circulation figures or breakdown whatsoever. These fields are:

Music, with 23 papers
Photography and photo-engraving with 6 papers
Tobacco industry with 12 papers

There are four fields where there are no A.B.C. papers, but where there is one or more C.C.A. papers. These four fields are:

Brewing, distilling, bottling and soft drinks	36 papers	2 CCA
Dentistry	21 "	3 "
Medicine	120 "	1 "
Rubber and tires	4 "	1 "

This analysis of the 1,374 trade papers indicates that generous advertising support is being given the unaudited papers and some are faring as well as or even better than the audited magazine.

A further study of the ages of the papers, together with their method of circulation, will serve to indicate the trend of trade paper publishing:

Period Established	A.B.C.	C.C.A.	Total Audited	Unaudited Association	Unaudited Free Distribution	Unaudited Paid	Total
Prior to 1875	20	1	21	12	2	44	79
1875-1900	74	3	77	34	5	180	296
1900-1925	106	20	126	195	41	363	725
1925-1933	18	24	42	41	64	120	267
Total	218	48	266	282	112	707	1,367
Undated				2	1	4	7
				284	113	711	1,374

Apparently there is a very definite trend toward free-controlled circulation papers, and there is evidence of an increase in association papers soliciting advertising.

What is the answer? Has the advertiser discounted the audit bureaus as of little or no real assistance in planning his trade paper schedule, and is he accepting the free-controlled circulation paper more openly than in the past? Certainly he is supporting a great many unaudited publications. Moreover, undoubtedly, many of the audited papers are leaders in their fields. Isn't it logical to suppose that many unaudited papers are covering a market which may be reached and perhaps better covered by the audited papers? Or, if the publisher is limiting his editorial appeal and circulation efforts to a particular side of the industry, may it not be true that that side of the industry would be reached and better covered if the audited papers were permitted to do a real job by sufficient advertising support? Isn't it logical to assume that if the trade paper advertiser were honest and, perhaps a little prayerful, in the selection of media, many of the papers would fold up or be absorbed by the stronger and audited paper in the field?

Without going into the subject of association organs, I should like to point a finger of warning to the great number of associations which have discovered in the past 20 years a heretofore unused source of revenue. Advertising support of some of these mouth-pieces must be open to honest questioning.

Free-controlled circulation growth calls for very thoughtful study and scrutiny. Apparently, coverage, as such, has become an all-important item. With the limited budgets necessary the past five years, coverage has been, quite naturally, in greater demand by advertisers who must cut their lists. But it must be recognized by the advertiser and agency that coverage is *not the most important item* in the selection of advertising media. By far the most important items are editorial excellence and reader interest.

In conclusion, it seems to me that advertisers have been supporting and continuing to support papers which long since should have gone the way of all unneeded flesh. Isn't it true that trade paper space buying as it has been done the past few years has done much to discredit this branch of advertising media? Isn't there something here to justify the advertiser's inclination to look upon trade papers as the "lame ducks" of his advertising plans?

Trade paper space buying has not given the better type of trade media an honest opportunity to do the kind of a job which it could have done had it received the real support of the advertisers. After all, the trade paper can exist only with adequate advertising revenue, and when this revenue is dissipated among papers whose sole reason for existing is for this advertising support, the better type of trade paper suffers.

Were the advertising revenue released only to those publications which recognize that the advertiser is entitled to *know* what he is buying with his money, and which honestly endeavor to furnish that advertiser with an editorial set-up and a reader audience which will make such advertising resultful, I believe that the trade paper publishing field would receive greater support from the public and an increasing recognition from the advertiser.

Reprinted from Advertising & Selling, June 7, 1934

"PERSONAL"

THIS MESSAGE APPLIES ONLY TO YOUR PRODUCTS

Premier Spring Wire, Weaving Wire, Pin Wire, Bolt, Rivet and Screw Wire, Broom and Brush Wire, Pinion Wire, Basic and Bessemer Screw Stock, Premier Tested Welding Wire, Flat Nut Stock, Hair Pin Wire, Mattress Wire, Music Spring Wire, Cold Finished Steel Bars, Pump Rod Bars, Wool Wire, Piano Wire and Wire Rods. Also U S S Stainless and Heat Resisting Wire.

THE wide variation of fabrication methods—and the countless conditions of service to which wire is subjected—these factors make its use a personal application problem for your product only. To determine the exact size and the precise grade, the special shape or analysis that will perfectly serve your need—is very definitely a part of this company's service. We render this truly personal service as a part of the unceasing vigilance that guards every detail of our production and assures the superior quality and constant uniformity which maintains our leadership. We will welcome the opportunity of explaining in detail just how this individual method of operation will bring you added value—and possibly added profit. Your request will bring complete and interesting information.

1831 MORE THAN 100 YEARS OF PROGRESS IN WIRE MAKING 1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York